



TECHNICAL REQUIREMENTS AND SPECIFICATIONS

PROJECT: Río Abajo y Urb. Buzo Damage Repair

MUNICIPALITY: Humacao

LOCATION: Latitude: 18. 145861 Longitude: -65.810094

Project Num.: 87595 **PW:** 10363 **Damage Inventory:** 253121

Acquisition : Formal Bid

Proposal Solicitation: RFP

HON. RAY J. QUIÑONES VÁZQUEZ
SECRETARY
DRD- PUERTO RICO
HURRICANE MARIA DAMAGE RECONSTRUCTION





GOBIERNO DE PUERTO RICO
DEPARTAMENTO DE RECREACION Y DEPORTES

PROPUESTA DEL LICITADOR

NOMBRE DE PROPONENTE

I – Proyecto: Rio Abajo y Urb. Buzo, Humacao, PR

Número de Subasta: _____

Numero de Proyecto: 87595

Sub-Proyecto: N/A

PW: 10363

Damage Inventory: 253121

II. Hacemos constar que hemos leído todas las instrucciones, términos, condiciones y cláusulas de la requisición de propuesta; que entendemos y aceptamos cumplir con todas las cláusulas contenidas en la convocatoria. Incluyendo las siguientes Adendum:

- (1) _____ Fecha: _____,
(2) _____ Fecha: _____,
(3) _____ Fecha: _____.

III. PROPUESTA BASE – (Incluye todas las tareas solicitadas según especificaciones, adendum, “allowances” y documentos de subasta)

\$ _____

IV. ALLOWANCES (ALLOWANCES SON PARTE DE LA PROPUESTA BASE)

1. General (\$5,000)

V.ALTERNAS

Alternativa#1 : N/A

Add/Deduct : \$ _____

VI.PRECIOS UNITARIOS PARA ADDICIONES/DEDUCCIONES

1. N/A

Add/Deduct: \$ _____

Yo, el firmante, CERTIFICO, que estoy autorizado a firmar esta oferta y mi nombre y firma constan registradas en el Registro de Licitadores de la Administración de Servicios Generales.

Nombre en Letra de Molde

Puesto o cargo que ocupa

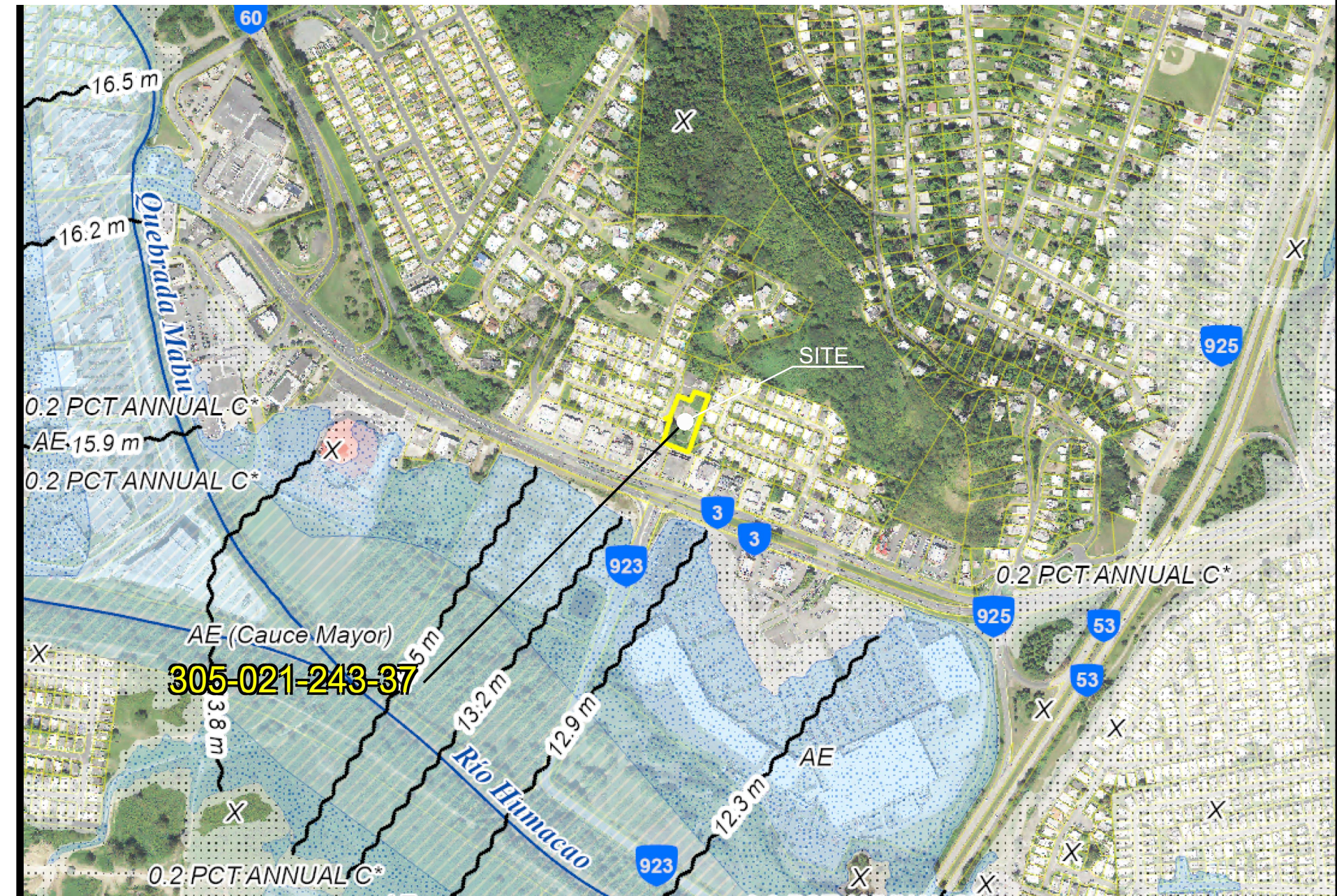
Firma

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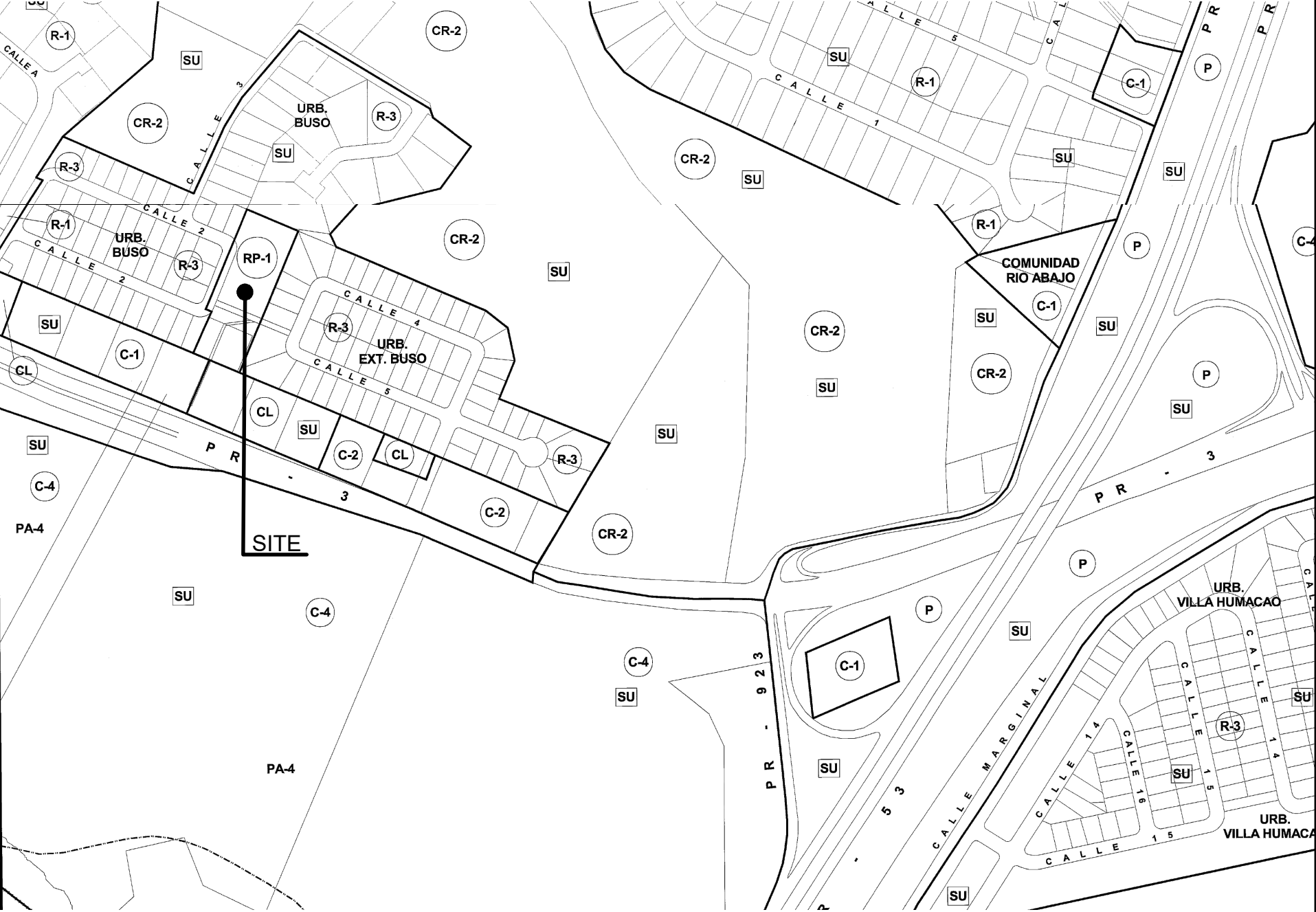
Dirección Física



AERIAL PHOTO
NAD83 COORDINATES
X=265,955.4191
Y=234,711.3692
Microsoft Bing - 2022
NOT TO SCALE



FLOOD MAP
MAP No.: 72000C1270J
MAP EFFECTIVE DATE: NOVEMBER 18, 2009
NOT TO SCALE



ZONING MAP
CALIFICATION MAP / SHEET
NOT TO SCALE

CONSTRUCTION DRAWINGS FOR:

RIO ABAJO Y URBANIZACION BUZO

HUMACAO, PUERTO RICO

INDEX OF DRAWINGS

DRAWING	TITLE
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C-02	SITE PLAN
C-03	BASKETBALL COURT FLOOR PLAN
C-04	DETAILS
C-05	LIGHT FIXTURES DETAILS
C-06	PHOTOS

PROJECT INFORMATION

DESIGNER:
FRACTAL ENGINEERING
1607 AVE PONCE DE LEON, COBIAN'S PLAZA BLDG.
2ND FLOOR, SUITE 202 SAN JUAN, PR 00909

OWNER:
DEPARTAMENTO DE RECREACION Y DEPORTES
GOBIERNO DE PUERTO RICO



DOEL F. MUÑIZ RIVERA, P.E. - LIC.: 26820
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2ND FLOOR, SUITE 202 SAN JUAN, PR 00909
T. 787.387.9039 DMUNIZ@FRACTALENGINEERS.COM

YO, ING. DOEL F. MUÑIZ RIVERA, NUMERO DE LICENCIA 26820, CERTIFICO QUE SOY EL PROFESIONAL QUE [CONFECCIONO, DISEÑO O PREPARO] ESTOS PLANOS Y LAS ESPECIFICACIONES COMPLEMENTARIAS. TAMBIEN CERTIFICO QUE ENTiendo QUE DICHOs PLANOS Y ESPECIFICACIONES CUMPLEN CON LAS DISPOSICIONES APLICABLES DEL REGLAMENTO CONJUNTO Y LAS DISPOSICIONES APLICABLES DE LOS REGLAMENTOS Y CODIGOS DE CONSTRUCCION VIGENTES DE LAS AGENCIAS, JUNTAS REGLAMENTADORAS O CORPORACIONES PUBLICAS CON JURISDICCION. CERTIFICO, ADEMAS, QUE EN LA PREPARACION DE ESTOS PLANOS Y ESPECIFICACIONES SE HA CUMPLIDO CABALMENTE CON LO DISPUESTO EN LA LEY NUM. 14 DE 8 DE ENERO DE 2004, SEGUN ENMENDADA, CONOCIDA COMO LS "LEY PARA LA INVERSION POR LA INDUSTRIA PUERTORRQUEÑA" Y CON LA LEY NUM. 319 DE 15 DE MAYO DE 1938, SEGUN ENMENDADA; LEY NUM. 96 DE 6 DE JULIO DE 1978, SEGUN ENMENDADA; SEGUN APLIQUE. RECONOZCO QUE CUALQUIER DECLARACION FALSA O FALSIFICACIONES DE LOS HECHOS QUE SE HAYA PRODUCIDO POR DESCONOCIMIENTO O POR NEGLIGENCIA YA SEA POR MI, MIS AGENTES O EMPLEADOS, O POR OTRAS PERSONAS CON MI CONOCIMIENTO, ME HACEN RESPONSABLE DE CUALQUIER ACCION JUDICIAL Y DISCIPLINARIA POR LA OGP.

TITLE SHEET, MAP & INDEX OF DRAWINGS

DESIGNED BY: D.MUÑIZ
DRAWING BY: L.RIVERA
CHECKED BY: D.MUÑIZ
DATE: 3/10/2023
SCALE: AS SHOWN

DRAWING ID
T-01

SHEET
1 OF XX

SCOPE OF WORK

- 1. REMOVE, 1 EACH OF CONCRETE LIGHT POLE, 30' HIGH.
- 2. APPLY ANTI-CORROSION COATING TO EXISTING METAL LIGHTING POST, 35' HIGH.
- 3. REPAIR EXPOSED REBAR AT BLEACHERS.
- 4. REMOVE AND REPLACE, 2 EACH OF ALUMINUM DOORS, 4' LONG x 7' HIGH.
- 5. REMOVE AND REPLACE, 6 EACH OF GLASS WINDOWS WITH METAL FRAME.
- 6. REMOVE AND REPLACE, 2 EACH OF CEILING FANS WITH LIGHT FIXTURES.
- 7. REMOVE AND REPLACE, 1 EACH OF A/C UNIT, ROOF MOUNTED.
- 8. REMOVE AND REPLACE 6,000 SF OF BOUNDARY CHAIN-LINK FENCE, 1,000' LONG x 6' HIGH.
- 9. REMOVE AND REPLACE, 1 EACH OF PLAYGROUND SWINGS EQUIPMENT, SWINGS, 4 SEATS, PLAIN SEATS, 12' HIGH.

ADDITIONAL FINDINGS

- 10. REMOVE AND REPLACE, EACH OF ATHLETIC LIGHT FIXTURES, AEON PNR SERIES, HL-APS OR SIMILAR.
- 11. REMOVE AND REPLACE, 1 EACH OF ATHLETIC LIGHT FIXTURE, GALN GALLEON II AREA LUMINAIRE BY MCGRAW-EDISON OR SIMILAR.
- 12. CRACK REPAIRS, PREPARE AND PAINT 4,800 SF OF BASKETBALL COURT FLOOR.
- 13. EXTERIOR PAINT - 2 COATS.
- 14. REMOVE AND REPLACE 276 SF OF CHAIN-LINK FENCE WITH TOP RAIL, 46' LONG x 6' HIGH.
- 15. REMOVE AND REPLACE 456 SF OF CHAIN-LINK FENCE WITH TOP RAIL, 76' LONG x 6' HIGH.

GENERAL DEMOLITION NOTES

HEALTH, SAFETY & WELFARE

- 1. TO TAKE THE NECESSARY PRECAUTIONS DURING DEMOLITION AND CONSTRUCTION TO PROTECT AND MAINTAIN THE INTEGRITY AND OPERATION OPERATION OF EXISTING OR TEMPORARY LIFE SAFETY AND EMERGENCY EGRESS AREAS AND SYSTEMS AS REQUIRED BY LOCAL BUILDING CODES
- 2. VERIFY WITH THE ARCHITECT ANY EXISTING SECURITY ITEMS TO BE REMOVED AND RE-USED, RE-INSTALLED AS DIRECTED.
- 3. THE CONTRACTORS ARE RESPONSIBLE FOR THE REMOVAL OF ALL DEMOLITION AND CONSTRUCTION DEBRIS GENERATED FROM WORK, TAKING CARE TO PREVENT OVERLOADING OF FLOOR ASSEMBLY AND PROTECTION OF ADJACENT EXISTING CONSTRUCTION.
- 4. DURING DEMOLITION, TAKE ALL PRECAUTIONS NECESSARY TO PREVENT STRUCTURAL AND OTHER DAMAGE TO THE SURROUNDING BUILDINGS EXISTING WALLS AND FINISHES.
- 5. ALL ITEMS INDICATED TO BE REMOVED AND ITEMS NOT INDICATED TO BE RE-USED SHALL BE DISPOSED OF PROPERLY AS AGREED UPON AND DIRECTED BY OWNER OR THEIR AGENT.

GENERAL CONDITIONS

- 1. VISIT THE JOB SITE TO VERIFY EXISTING CONDITIONS AND DIMENSIONS PRIOR TO BEGINNING ANY WORK. NOTIFY THE ARCHITECT AS SOON AS POSSIBLE OF ANY DISCREPANCIES FOR RESOLUTION OF THE ISSUE(S) PRIOR TO THE BEGINNING OF ANY WORK. PROCEEDING IS ACCEPTED BY ARCHITECT.
- 2. THE CONTRACTOR SHALL NOT CONSIDER DEMOLITION AND ALTERATION NOTES TO BE ALL INCLUSIVE. IT IS CONTRACTOR RESPONSIBILITY TO INSPECT AND ASSESS EACH AREA AND TO FULFILL THE INTEND OF THE DESIGN INDICATED BY THE CONTRACTOR DOCUMENTS.
- 3. THE CONTRACTOR SHALL VERIFY ALL CONDITIONS AND DIMENSIONS WITH THE CONTRACT LIMIT AND NOTIFY THE ARCHITECT IMMEDIATELY IN WRITING OF ANY DEVIATION FROM THE CONTRACT DOCUMENTS NECESSITATED BY FIELD CONDITIONS OR ITEMS NOT COVERED.
- 4. ALL DEMOLITIONS SHALL BE PERFORMED IN A SAFE AND ACCEPTABLE MANNER TO ALL AUTHORITIES HAVING JURISDICTION AND THE OWNER. A FIRE WATCH SHALL BE PROVIDED IF ANY HAZARDOUS SITUATIONS ARE THOUGHT TO BE POSSIBLE. COMPLY WITH GOVERNING REGULATIONS PERTAINING TO ENVIRONMENTAL PROTECTION FOR POLLUTION CONTROL. THOROUGHLY CLEAN AT ADJACENT AREAS OF DUST, DIRT AND DEBRIS CAUSED BY DEMOLITION WORK.
- 5. PROVIDE TEMPORARY PARTITIONS / DUST PROTECTION (RATED AND/OR NONRATED) AS REQUIRED, REVIEW LOCATION OF TEMPORARY PARTITIONS / DUST PROTECTION WITH OWNER AND ARCHITECT PRIOR TO START OF WORK.
- 6. HAZARDOUS MATERIAL NOTE: CONTRACTOR SHALL STOP WORK AND INFORM OWNER IMMEDIATELY IN WRITING HAZARDOUS MATERIAL ENCOUNTERED OR THOUGHT TO BE HAZARDOUS MATERIAL. THE OWNER AFTER RECEIVING WRITTEN NOTICE SHALL INSTRUCT CONTRACTOR ON HOW TO PROCEED.

GENERAL NOTES

- 1. ALL DIMENSIONS AND ELEVATIONS ARE EXPRESSED IN FEET, UNLESS OTHERWISE NOTED.
- 2. PLAN WAS PREPARED USING SATELLITE IMAGERY.
- 3. EXISTING TREES WITHIN THE PROPERTY AREA TO REMAIN.
- 4. CONTRACTOR IS RESPONSIBLE ON TAKING NECESSARY PRECAUTION AND FOLLOWING LOCAL REGULATIONS (PREPALUMA) PROCEDURES WHEN PERFORMING ELECTRICAL WORK.

ENVIRONMENTAL HISTORICAL PRESERVATION NOTES:

- 1. IF GROUND DISTURBING ACTIVITIES OCCUR DURING CONSTRUCTION, APPLICANT WILL MONITOR GROUND DISTURBANCE AND IF ANY POTENTIAL ARCHAEOLOGICAL RESOURCES ARE DISCOVERED, WILL IMMEDIATELY CEASE CONSTRUCTION IN THAT AREA AND NOTIFY THE STATE AND FEMA.
- 2. EXECUTIVE ORDER 11990 - WETLANDS: THE CONTRACTOR MUST ENSURE BEST MANAGEMENT PRACTICES ARE IMPLEMENTED TO PREVENT EROSION AND SEDIMENTATION TO SURROUNDING, NEARBY OR ADJACENT WETLANDS. TO ENSURE THAT WETLANDS ARE NOT ADVERSELY IMPACTED, PER THE CLEAN WATER ACT AND EXECUTIVE ORDER 119900. EQUIPMENT STORAGE AND STAGING OF CONSTRUCTION MATERIALS AND MACHINERY MUST BE IN A LOCATION THAT WOULD PREVENT EROSION AND SEDIMENTATION.
- 3. ENDANGERED SPECIES ACT (ESA): THE APPLICANT MUST PROVIDE DOCUMENTATION AT CLOSE-OUT THAT PROVES COMPLETION OF REQUIRED CONSERVATION MEASURES. CONDITIONS FOR PUERTO RICAN BOA.
 - 3.1. INFORM ALL PERSONNEL ABOUT THE POTENTIAL PRESENCE OF THE PR BOA AND THE VI BOA I N AREAS WHERE THE PROPOSED WORK WILL BE CONDUCTED. PHOTOGRAPHS OF THE PR AND VI BOA ARE TO BE PROMINENTLY DISPLAYED AT THE SITE. THIS MEASURE WILL BE CONDUCTED I N ACCORDANCE WITH THE FEMA/USFWS/DNER-APPROVED SOP FOR EMPLOYEE BOA AWARENESS TRAINING AND PROJECT SITE PREPARATION.
 - 3.2. TRAIN PROJECT PERSONNEL ON THE IDENTIFICATION AND HANDLING OF SNAKES SO THEY CAN BE AVAILABLE TO RESPOND TO SIGHTINGS AND AS NECESSARY SAFELY HANDLE BOAS FOUND AT PROJECT SITES. VERIFY WITH THE PUERTO RICO DNER IF A PERMIT IS NEEDED FOR SNAKE HANDLING AND/OR RELOCATION ACTIVITIES. THIS MEASURE WILL BE CONDUCTED I N ACCORDANCE WITH THE FEMA/USFWS/DNER-APPROVED SOP FOR EMPLOYEE BOA AWARENESS TRAINING AND PROJECT SITE PREPARATION. ALTERNATIVELY, BIOLOGICAL PROFESSIONALS CAN BE HIRED FOR THIS TASK.
 - 3.3. PRIOR TO ANY CONSTRUCTION ACTIVITY, INCLUDING REMOVAL OF VEGETATION AND EARTH MOVEMENT, THE CONTRACTOR-DELINEATED BOUNDARIES OF THE PROJECT AREA, THE BUFFER ZONES, AND AREAS TO BE EXCLUDED AND PROTECTED SHOULD BE CLEARLY MARKED I N THE PROJECT PLAN AND IN THE FIELD TO AVOID FURTHER HABITAT DEGRADATION INTO FORESTED AREAS. ONCE AREAS ARE CLEARLY MARKED, AND PRIOR TO ANY CONSTRUCTION ACTIVITY, INCLUDING SITE PREPARATION, PERSONNEL TRAINED I N BOA IDENTIFICATION MUST SURVEY THE AREAS TO BE CLEARED TO ENSURE THAT NO BOAS ARE PRESENT WITHIN THE WORK AREA. VEHICLE AND EQUIPMENT OPERATION MUST REMAIN ON DESIGNATED ACCESS ROADS/PATHS AND WITHIN RI GHTS-OF THIS MEASURE WILL BE CONDUCTED I N ACCORDANCE WITH THE FEMA/USFWS/DNER-APPROVED SOP FOR EMPLOYEE BOA AWARENESS TRAINING AND PROJECT SITE PREPARATION. ALTERNATIVELY, BIOLOGICAL PROFESSIONALS CAN BE HIRED FOR THIS TASK.
 - 3.4. IF BOAS ARE FOUND WITHIN ANY OF THE WORKING OR CONSTRUCTION AREAS, ACTIVITIES SHALL STOP I N THE AREA WHERE BOAS ARE FOUND. BOAS MUST BE SAFELY CAPTURED AND RELOCATED AT LEAST 1 KM FROM PROJECT, WITHIN SUITABLE FORESTED HABITAT, AND AWAY FROM CONSTRUCTION AREAS AND ROADS. RELOCATION OF BOAS SHALL BE DONE BY TRAINED AND DESIGNATED PERSONNEL AND SHALL NOT HARM OR INJURE CAPTURED BOAS. ACTIVITIES AT OTHER WORK SITES, WHERE NO BOAS HAVE BEEN FOUND AFTER SURVEYING THE AREA, MAY CONTINUE. IF IMMEDIATE RELOCATION IS NOT AN OPTION, PROJECT-RELATED ACTIVITIES AT THIS AREA MUST STOP UNTIL THE BOA MOVES OUT OF HARM'S WAY ON ITS OWN. ANOTHER OPTION I S TO CALL DNER RANGERS FOR SAFE CAPTURE AND RELOCATION (DNER PHONE #S: 787-724-5700, 787230-5550, 787-771-1124). THIS MEASURE WILL BE CONDUCTED I N ACCORDANCE WITH THE FEMA/USFWS/DNER-APPROVED SOP FOR EMPLOYEE BOA AWARENESS TRAINING AND PROJECT SITE PREPARATION. ALTERNATIVELY, BIOLOGICAL PROFESSIONALS CAN BE HIRED FOR THIS TASK.
 - 3.5. ANY HEAVY MACHINERY LEFT ON SITE (IN STAGING) WITHIN 50 METERS OF FOREST VEGETATION NEEDS TO BE THOROUGHLY INSPECTED EACH MORNING BEFORE WORK STARTS TO ENSURE THAT NO BOAS ARE SHELTERED WITHIN ENGINE COMPARTMENTS OR OTHER AREAS OF THE EQUIPMENT. IF BOAS ARE FOUND WI THIN VEHICLES OR EQUIPMENT, BOAS NEED TO BE SAFELY CAPTURED AND RELOCATED. THIS MEASURE WILL BE CONDUCTED I N ACCORDANCE WITH THE FEMA/USFWS/DNER-APPROVED SOP FOR EMPLOYEE BOA AWARENESS TRAINING AND PROJECT SITE PREPARATION. ALTERNATIVELY, BIOLOGICAL PROFESSIONALS CAN BE HIRED FOR THIS TASK.
 - 3.6. PRIOR TO MOVING,DISPOSING OR SHREDDING, DEBRIS PILES SHALL BE CAREFULLY INSPECTED FOR THE PRESENCE OF BOAS. IF BOAS ARE FOUND I N DEBRIS PILES, CONTRACTORS SHALL WAIT FOR BOAS TO MOVE AWAY ON THEIR OWN; IF THIS DOES NOT OCCUR, BOAS NEED TO BE SAFELY CAPTURED AND RELOCATED. THIS MEASURE WILL BE CONDUCTED I N ACCORDANCE WITH THE FEMA/USFWS/DNER-APPROVED SOP FOR EMPLOYEE BOA AWARENESS TRAINING AND PROJECT SITE PREPARATION.
 - 3.7. ALTERNATIVELY, BIOLOGICAL PROFESSIONALS CAN BE HIRED FOR THIS TASK.
- 4. RESOURCE CONSERVATION AND RECOVERY ACT, AKA SOLID WASTE DISPOSAL ACT (RCRA): THE APPLICANT SHALL HANDLE, MANAGE, AND DISPOSE OF ALL SOLID AND HAZARDOUS WASTE I N ACCORDANCE WITH REQUIREMENTS OF LOCAL, STATE, AND FEDERAL LAWS, REGULATIONS, AND ORDINANCES. I N ADDITION, THE APPLICANT SHALL ENSURE THAT ALL DEBRIS IS SEPARATED AND DISPOSED OF I N A MANNER CONSISTENT WITH THE PR DNER GUIDELINES AT A PERMITTED SITE OR LANDFILL.

PROJECT NOTES:

A.DEMOLITION

CONTRACTOR MUST PREPARE, SUBMIT AND GET APPROVAL FROM OGPo OF AN INCIDENTAL UNIQUE PERMIT.
CONTRACTOR MUST CONSIDER PARTIAL OR COMPLETE DEMOLITION OF EXISTING BASKETBALL COURT FOUNDATIONS, NECESSARY FOR THE CONSTRUCTION OF THE NEW FOUNDATIONS.
EXTERIOR DEMOLITIONS INCLUDE SIDEWALKS AND EXISTING SLABS AS SHOWN.
DEMOLITION SHALL BE DONE IN A MATTER THAT REDUCES TO A MINIMUM THE AMOUNT OF DUST.
CONTRACTOR MUST PREPARE A MAINTENANCE OF TRAFFIC AND OBTAIN WRITTEN APPROVAL FROM THE MUNICIPAL DEPARTMENT OF PUBLIC WORKS.
DEMOLITION WORKS NOT IDENTIFIED IN THE DEMOLITION SITE PLAN, BUT NECESSARY FOR THE CONSTRUCTION OF THE PROJECT ARE A SUBSIDIARY OBLIGATION.

B.SITE IMPROVEMENTS

SITE IMPROVEMENTS INCLUDE THE RE CONSTRUCTION SLABS, SIDEWALKS AND ANY OTHER SITE FEATURE AFFECTED BY THE CONSTRUCTION OF THE NEW BASKETBALL ROOF AND OTHER IMPROVEMENTS IN THE PROJECT.
TEMPORARY RELOCATION OF SITE FEATURES MUST BE COORDINATED WITH THE OWNER.
RECONSTRUCTION OF CHAIN LINK FENCE AND GATES.
AT DOWNSPOUTS, WHENEVER SIDEWALKS OR CONCRETE SURFACES DOES NOT EXISTS, THE CONTRACTOR MUST PROVIDE SPLASH BLOCKS AS DETAILED IN THE CONSTRUCTION DRAWINGS.

C.NEW ROOF AND EXISTING ROOFS TO BE REPAIRED

CONTRACTOR MUST PROVIDE AND INSTALL A NEW STRUCTURAL STEEL ROOF AS SHOWN IN PLANS. APPROVED EQUAL ALTERNATIVES FOR THE ROOF PANELS:
ROOF STEEL DECK, GALVANIZED G-90 COATING TYPE "R", GAGE 24. REFER TO STRUCTURAL DRAWINGS.
COMPOSITE STEEL AND BITUMINOUS PLATE GAGE 24 EQUAL OR APPROVED EQUAL TO MULTILAYER ISOMETRIC.
NEW ROOF INCLUDE NEW FOUNDATIONS AS SHOWN ON PLANS.
CONTRACTOR MUST REPAIR THE EXISTING METAL ROOFS AS SHOWN ON PLANS. CONTRACTOR MUST SUPPLY AND INSTALL ADDITIONAL HANGERS TO ALL BLEACHERS AND DUGOUT GUTTERS (NEW AND EXISTING TO REMAIN) AS TO PROVIDE A MAXIMUM SPACING OF 3FT IN BETWEEN.
ROOFS TO BE REPAIRED INCLUDE SAME MATERIAL AND SHAPE AS THE EXISTING ROOF TO REMAIN UNLESS OTHERWISE SPECIFIED.

D.PAINT

CONTRACTOR MUST PRIME AND PAINT THE BASKETBALL COURT ROOF, PEDESTAL AND SLAB AS SPECIFIED IN PLANS AND SPECIFICATIONS.
CONTRACTOR MUST PRIME AND PAINT CHANNELS TO BE REPLACED. FOR COLORS AND SPECIFICATIONS REFER TO DRAWING A-201.
STRUCTURAL STEEL MUST BE PAINTED WITH PRIMER AT SHOP AND PAINTED ON FIELD WITH TWO COATS OF AN APPROVED RUST PREVENTIVE PAINT.
OTHER EXISTING PAINTED AREAS AFFECTED DURING CONSTRUCTION MUST BE REPAINTED. CONTRACTOR MUST MATCH THE EXISTING COLORS UNLESS SPECIFIC COLORS ARE PROVIDED BY THE OWNER.

E.FLOORS

BASKETBALL COURT SLAB MUST BE CLEANED AND REPAIRED AS SPECIFIED IN PLANS PRIOR TO THE APPLICATION OF PAINT.

F.AS-BUILT DATA

AS-BUILT DIMENSIONS ARE APPROXIMATE AND MAY VARY FROM FIELD CONDITIONS.
CONTRACTOR IS RESPONSIBLE FOR VERIFYING AS-BUILT DIMENSIONS PRIOR TO CONSTRUCTION/DEMOLITION WORKS.
FOUNDATION

G.POWER, LIGHTING AND OTHER ELECTRICAL FEATURES

ELECTRICAL PLANS INCLUDE BASKETBALL COURT POWER AND NEW LIGHTING.
CONNECTION POINT AND IMPROVEMENTS ARE AS SHOWN ON ELECTRICAL DRAWINGS.
COVER OF ELECTRICAL TRENCHES MUST MATCH THE EXISTING COVER AS SHOWN:
GRASS - 3" MINIMUM OF TOP SOIL AND TURF (ZOYSIA MANILA).
CONCRETE - MUST BE SAW CUT. FOR RECONSTRUCTION REFER TO SLAB AND JOINT DETAILS IN DRAWING CS801.
REPAIR TO EXISTING SYSTEM SERVICING THE PROJECT ARE A SUBSIDIARY OBLIGATION.

H.WORK AREA

CONTRACTOR MUST COORDINATE WITH THE OWNER THE WORK AND STAGING AREAS WITH THE OWNER.
WORK AND STAGING AREAS MUST BE RESTRICTED FROM ACCESS AS ESTABLISHED IN THE GENERAL CONDITIONS.


OTHERS

CONTRACTOR MUST COMPLY WITH ALL LOCAL, STATE AND FEDERAL PROCUREMENT LAWS, REGULATIONS, AND PROCEDURES AS

CONTRACTOR MUST COMPLY WITH ALL APPLICABLE LAWS, REGULATIONS, POLICY, AND GUIDANCE. THIS INCLUDES, AMONG OTHERS, THE ROBERT T. STAFFORD DISASTER RELIEF AND EMERGENCY ASSISTANCE ACT; TITLE 44 OF THE CODE OF FEDERAL REGULATIONS; FEMA POLICY NO. 104-009-2, PUBLIC ASSISTANCE POLICY AND PROGRAM GUIDE; AND OTHER FEMA POLICY AND GUIDANCE.
THE UNIFORM ADMINISTRATIVE REQUIREMENTS, COST PRINCIPLES, AND AUDIT REQUIREMENTS SET FORTH AT 2 C.F.R. PT. 200 APPLY TO THIS PROJECT AWARD UNDER THE PUBLIC ASSISTANCE GRANT, WHICH FLOW DOWN FROM THE RECIPIENT TO ALL SUB RECIPIENTS UNLESS A PARTICULAR SECTION OF 2 C.F.R. PT. 200, THE FEMA-STATE AGREEMENT, OR THE TERMS AND


PUERTO RICO BUILDING CODE, IBC, AND RECEIVING ALL APPLICABLE PERMITS & APPROVALS PRIOR TO CONSTRUCTION.
CONTRACTOR MUST REFER TO OTHER CONTRACT DOCUMENTS FOR WORKS AND PROCEDURES NOT INCLUDING IN THESE PLANS INCLUDING BUT NOT LIMITED TO CONSTRUCTION SPECIFICATIONS, PRE-BID CONFERENCE, GENERAL CONDITIONS AND SPECIAL CONDITIONS.
CONTRACTOR MUST CONSIDER ALL APPLICABLE STATE REGULATIONS REGARDING CONSTRUCTION PROCEDURES SUCH AS LIMITATION TO WORK HOURS BY EXECUTIVE ORDERS AND COVID-19 SAFETY PROCEDURES.
THE FENCE WORK, THE DEMOLITION WORK AND THE NEW CONSTRUCTION WORK WILL BE DONE I N PREVIOUSLY DISTURBED GROUND AND I N THE SAME FOOTPRINT OF THE PRE-DISASTER FENCE AND PAVILIONS. NO WORK WILL AFFECT UNDISTURBED GROUND.
FOR WORK TO BE COMPLETED, WHEN DISPOSING OF DEBRIS INCLUDING, BUT NOT LIMITED TO (FENCING, RETENTION WALLS, CONCRETE, ASPHALT, AC UNITS, LIGHT POLES, DEMOLITION (CASE BY CASE), NEW CONSTRUCTION (CASE BY CASE), AMONG OTHER ACTIVITIES) THE FOLLOWING SHOULD BE INCLUDED I N THE PROJECT DOCUMENTS:
STAGING AREA (COORDINATES)
TYPE OF MATERIAL
QUANTITY BY TYPE
FINAL DISPOSAL SITE (COORDINATES)
THE PERMIT FOR THE FINAL DISPOSAL SITE.

OWNER




DEPARTAMENTO DE RECREACIÓN Y DEPORTES

CONSULTANT



FRACTAL
ENGINEERING

DOEL F. MUÑIZ RIVERA, P.E. - LIC. 26820
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PROJECT MANAGEMENT • ENGINEERING • DESIGN

CERTIFICATION

YO, ING. DOEL F. MUÑIZ RIVERA, NUMERO DE LICENCIA 26820, CERTIFICO QUE SOY EL PROFESIONAL QUE (CONFECCIONO, DISEÑO O PREPARO) ESTOS PLANOS Y LAS ESPECIFICACIONES COMPLEMENTARIAS, TAMBIEN CERTIFICO QUE ENTiendo QUE DICHOs PLANOS Y ESPECIFICACIONES CUMPLEN CON LAS DISPOSICIONES APLICABLES DEL REGLAMENTO CONJUNTO Y LAS DISPOSICIONES APLICABLES DE LOS REGLAMENTOS Y CODIGOS DE CONSTRUCCION VIGENTES DE LAS AGENCIAS, JUNTAS REGLAMENTADORAS O CORPORACIONES PUBLICAS CON JURISDICCION. CERTIFICO, ADEMAS, QUE EN LA PREPARACION DE ESTOS PLANOS Y ESPECIFICACIONES SE HA CUMPLIDO CABALMENTE CON LO DISPUESTO EN LA LEY NUM.14 DE 8 DE ENERO DE 2004, SEGUN ENMENDADA, CONOCIDA COMO LA "LEY PARA LA INVERSION POR LA INDUSTRIA PUERTORRIQUEÑA" Y CON LA LEY NUM. 319 DE 15 DE MAYO DE 1939, SEGUN ENMENDADA LEY NUM. 96 DE 6 DE JULIO DE 1978, SEGUN ENMENDADA; SEGUN APLIQUEL RECONOZCO QUE CUALQUIER DECLARACION FALSA O FALSIFICACIONES DE LOS HECHOS QUE SE HA YA P R O D U C I D O P O R DESCONOCIMIENTO O POR NEGLIGENCIA YA SEA POR MI, MIS AGENTES O EMPLEADOS, O POR OTRAS PERSONAS CON MI CONOCIMIENTO, ME HACEN RESPONSABLE DE CUALQUIER ACCION JUDICIAL Y DISCIPLINARIA POR LA OGP.

PROJECT

RIO ABAJO Y
URBANIZACION BUZO

HUMACAO, PR

SCOPE OF WORK &
GENERAL NOTES

DESIGNED BY:
D.MUÑIZ

DRAWING BY:
P.RESTO

CHECKED BY:
D.MUÑIZ

DATE:
3/10/2023

SCALE:
AS SHOWN

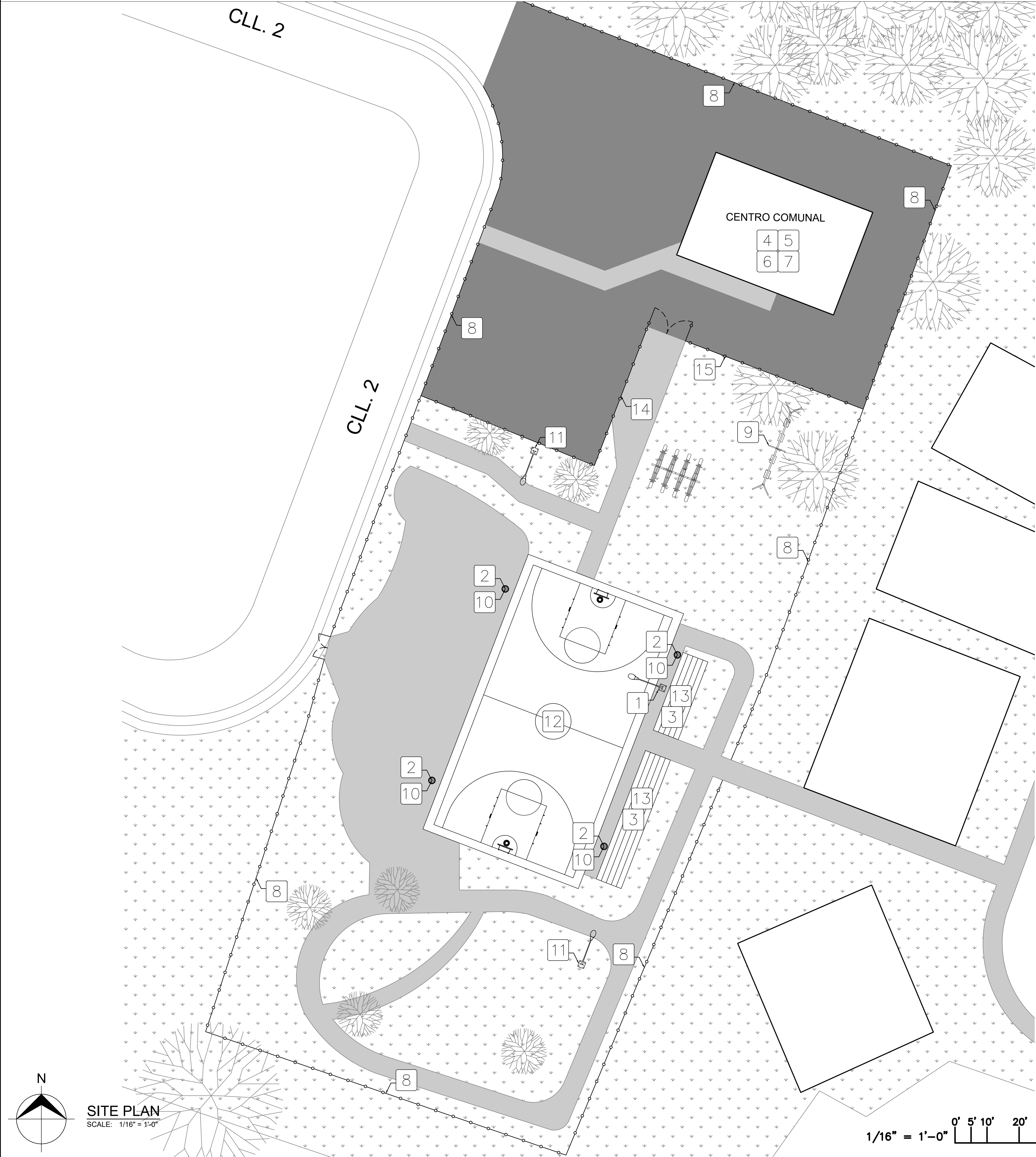
DRAWING ID

C-01

SHEET

2 OF XX

SITE PLAN:



SYMBOLS LEGEND:

- SAND AREA
- GRASS AREA
- CONCRETE SIDEWALK
- ASPHALT AREA
- EXISTING TREE
- METAL LIGHT POLE
- CONCRETE LIGHT POLE
- CHAIN LINK FENCE

DAMAGE DESCRIPTION:

- PROPOSED WORK:**
- 1 REMOVE, 1 EACH OF CONCRETE LIGHT POLE, 30' HIGH
 - 2 APPLY ANTI-CORROSION COATING TO EXISTING METAL LIGHTING POST, 35' HIGH
 - 3 REPAIR EXPOSED REBAR AT BLEACHERS. (VERIFY LOCATION IN FIELD) (SEE PHOTOS 1 & 2 IN C-05) (SEE DETAILS IN C-04)
 - 4 REMOVE AND REPLACE, 2 EACH OF ALUMINUM DOORS, 4' LONG x 7' HIGH. (VERIFY LOCATION IN FIELD) (NOT NEEDED)
 - 5 REMOVE AND REPLACE, 6 EACH OF GLASS WINDOWS WITH METAL FRAME. (VERIFY LOCATION IN FIELD) (NOT NEEDED)
 - 6 REMOVE AND REPLACE, 2 EACH OF CEILING FANS WITH LIGHT FIXTURES. (VERIFY LOCATION IN FIELD) (NOT NEEDED)
 - 7 REMOVE AND REPLACE, 1 EACH OF A/C UNIT ROOF MOUNTED. (VERIFY LOCATION IN FIELD) (NOT NEEDED)
 - 8 REMOVE AND REPLACE, 6,000 SF OF BOUNDARY CHAIN-LINK FENCE, 1,000' LONG x 6' HIGH. (SEE DETAILS C-04)
 - 9 REMOVE AND REPLACE, 1 EACH OF PLAYGROUND SWINGS EQUIPMENT, SWINGS, 4 SEAT, PLAIN SEATS, 12' HIGH. (SEE DETAILS IN C-04)
- ADDITIONAL WORK:**
- 10 REMOVE AND REPLACE, EACH OF ATHLETIC LIGHT FIXTURES, AEON PNR SERIES, HL-APS OR SIMILAR. INSTALL AS PER MANUFACTURERS SPECIFICATIONS). (SEE DETAILS IN C-05)
 - 11 REMOVE AND REPLACE, 1 EACH OF ATHLETIC LIGHT FIXTURE, GALN GALLEON II AREA LUMINAIRE BY MCGRAW-EDISON OR SIMILAR. (SEE DETAILS IN C-04)
 - 12 CRACK REPAIRS, PREPARE AND PAINT 4,800 SF OF BASKETBALL COURT FLOOR. (SEE DETAILS IN C-03) (SEE PHOTO 3 IN C-06)
 - 13 EXTERIOR PAINT - 2 COATS
 - 14 REMOVE AND REPLACE 276 SF OF CHAIN-LINKED FENCE WITH TOP RAIL, 46' LONG x 6' HIGH. (SEE DETAILS IN C-04)
 - 15 REMOVE AND REPLACE 456 SF OF CHAIN-LINKED FENCE WITH TOP RAIL, 76' LONG x 6' HIGH. (SEE DETAILS IN C-04)

OWNER



DRD
DEPARTAMENTO DE RECREACIÓN Y DEPORTES

CONSULTANT



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ENGINEERING

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BR&A
PROJECT MANAGEMENT • ENGINEERING • DESIGN

CERTIFICATION

YO, ING. DOEL F. MUÑIZ RIVERA, NUMERO DE LICENCIA 26820, CERTIFICO QUE SOY EL PROFESIONAL QUE [CONFECCIONO, DISEÑO O PREPARO] ESTOS PLANOS Y LAS ESPECIFICACIONES COMPLEMENTARIAS. TAMBIEN CERTIFICO QUE ENTENDIENDO QUE DICHS PLANOS Y ESPECIFICACIONES CUMPLEN CON LAS DISPOSICIONES APPLICABLES DEL REGLAMENTO CONJUNTO Y LAS DISPOSICIONES APPLICABLES DE LOS REGLAMENTOS Y CODIGOS DE CONSTRUCCIÓN VIGENTES DE LAS AGENCIAS, JUNTAS REGLAMENTADORAS O CORPORACIONES PUBLICAS CON JURISDICCION. CERTIFICO, ADEMAS, QUE EN LA PREPARACION DE ESTOS PLANOS Y ESPECIFICACIONES SE HA CUMPLIDO CABALMENTE CON LO DISPUESTO EN LA LEY NUM. 14 DE 8 DE ENERO DE 2004, SEGUN ENMENDADA, CONOCIDA COMO LA "LEY PARA LA INVERSION POR LA INDUSTRIA PUERTORRIQUEÑA" Y CON LA LEY NUM. 319 DE 15 DE MAYO DE 1939, SEGUN ENMENDADA. LEY NUM. 96 DE 6 DE JULIO DE 1978, SEGUN ENMENDADA; SEGUN APLIQUE], RECONOZCO QUE CUALQUIER DECLARACION FALSA O FALSIFICACIONES DE LOS HECHOS QUE SE HA Y A. P R O D U C I D O . P O R DESCONOCIMIENTO O POR NEGLIGENCIA YA SEA POR MI, MIS AGENTES O EMPLEADOS, O POR OTRAS PERSONAS CON MI CONOCIMIENTO, ME HACEN RESPONSABLE DE CUALQUIER ACCION JUDICIAL Y DISCIPLINARIA POR LA OGP.

PROJECT

RIO ABAJO Y
URBANIZACION BUZO

HUMACAO, PR

SITE PLAN

DESIGNED BY:
D.MUÑIZ

DRAWING BY:
P.RESTO

CHECKED BY:
D.MUÑIZ

DATE:
3/10/2023

SCALE:
AS SHOWN

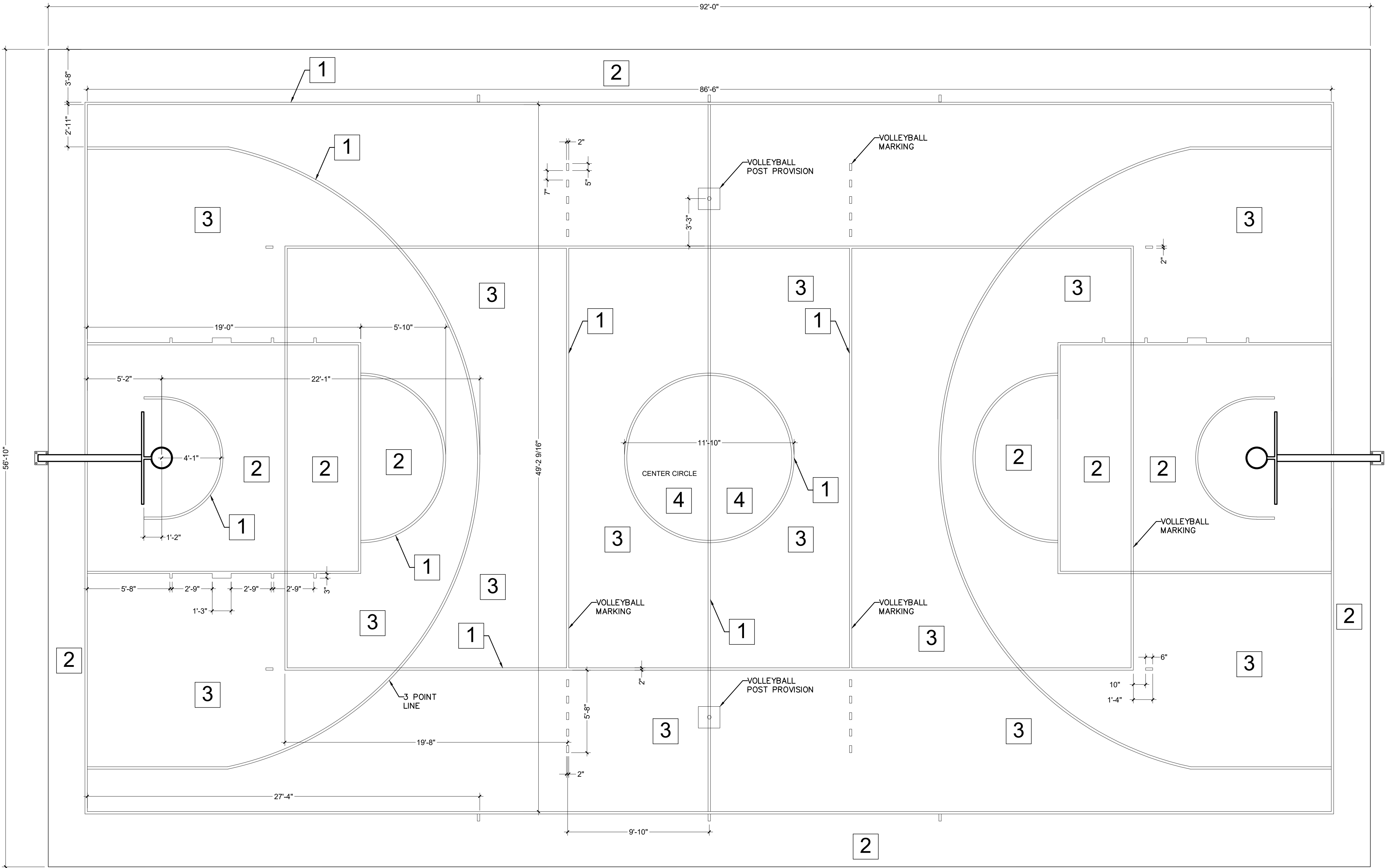
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C-02

SHEET

3 OF XX

BASKETBALL COURT FLOOR PLAN:



BASKETBALL COURT FLOOR PLAN
SCALE: 1/4" = 1'-0"

COLORS LEGEND:

- 1 WHITE
- 2 GREEN (GLIDDEN 1103 OR SIMILAR)
- 3 BLUE (GLIDDEN 1523 OR SIMILAR)
- 4 GRAY (GLIDDEN 1351 OR SIMILAR)

OWNER

DRD
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PROJECT MANAGEMENT • ENGINEERING • DESIGN

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PROJECT

RIO ABAJO Y
URBANIZACION BUZO

HUMACAO, PR

BASKETBALL COURT
FLOOR PLAN

DESIGNED BY:
D. MUÑIZ

DRAWING BY:
P. RESTO

CHECKED BY:
D. MUÑIZ

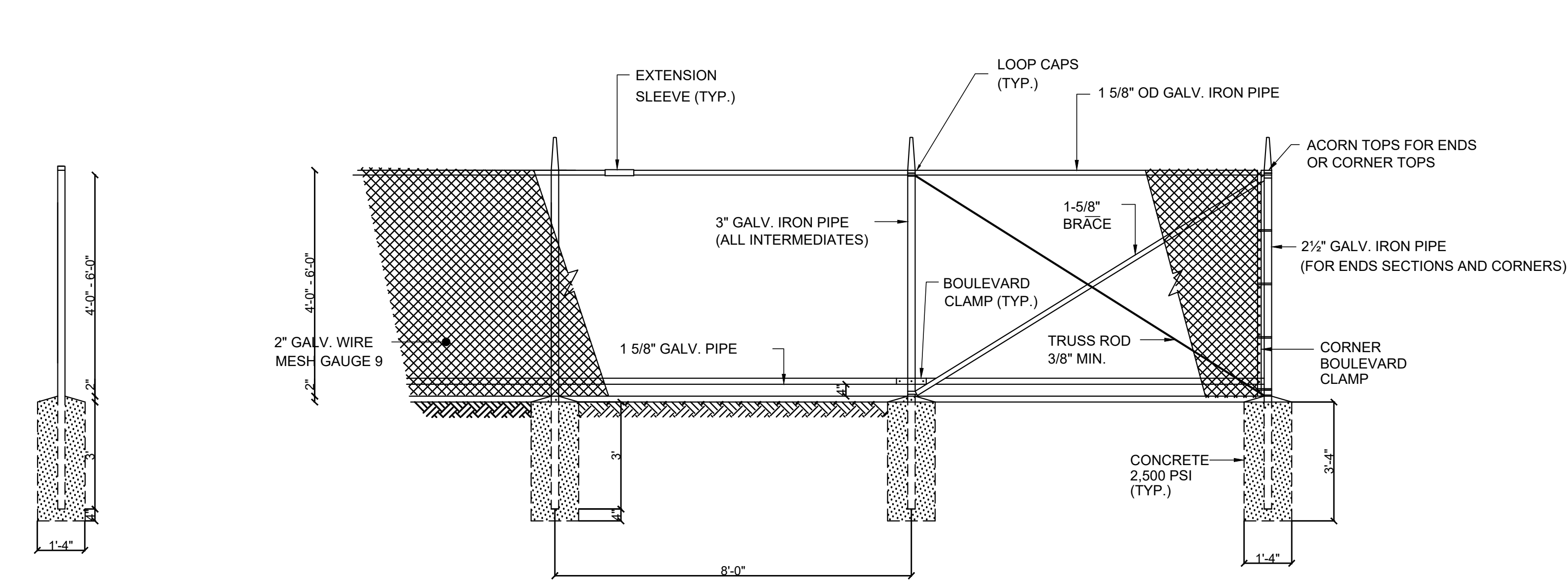
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3/10/2023

SCALE:
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DRAWING ID
C-03

SHEET
4 OF XX

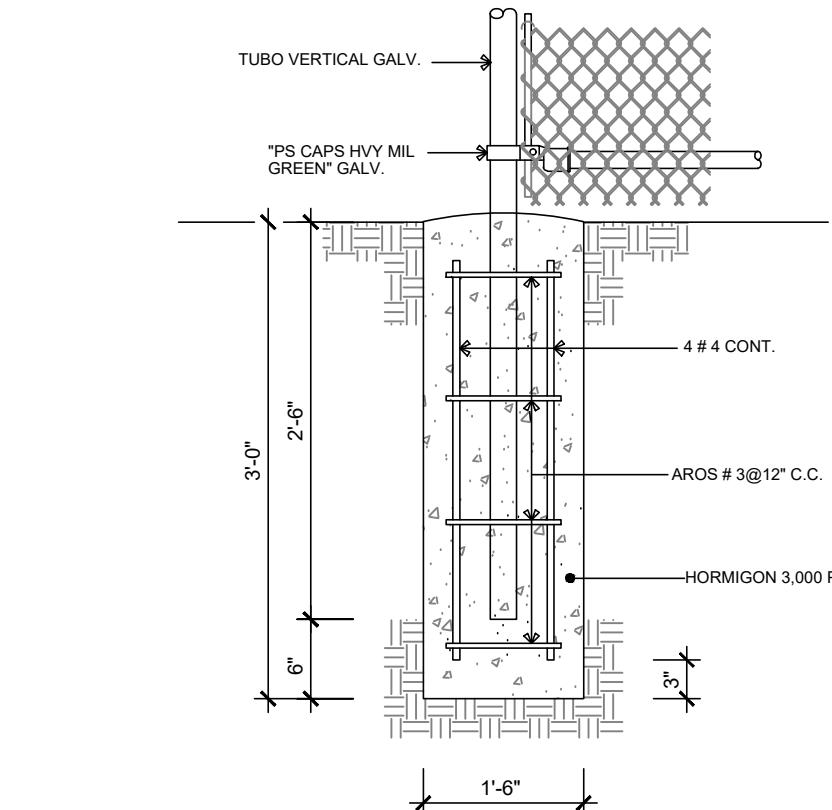
DETAILS:



- NOTE:
1. PVC COATED WIRE MESH SHALL BE PROVIDED ON ALL BIDS AS AN OPTION.
 2. RAZOR RIBBON SHALL BE INSTALLED IN 18" CIRCLES WITH AN SPACING NOT TO EXCEED 12".

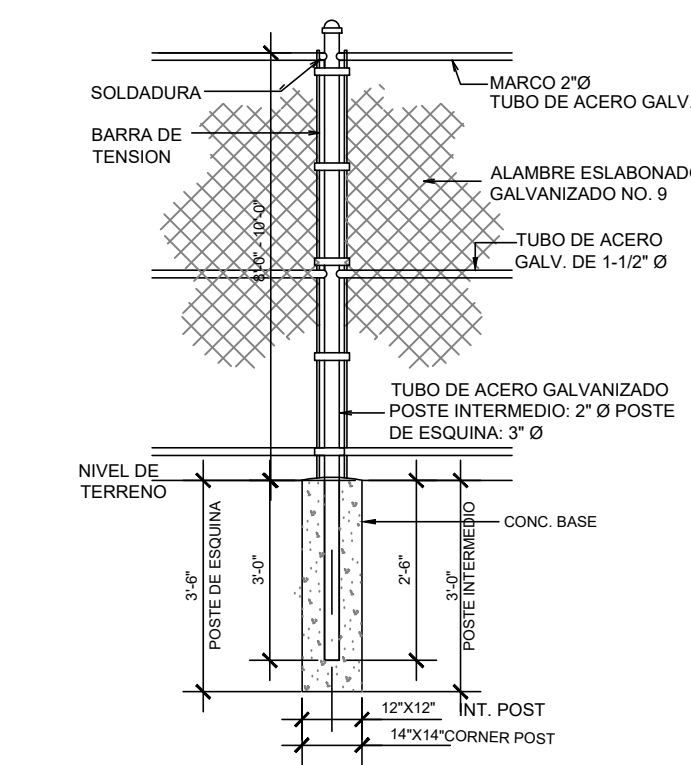
CHAIN LINK FENCE DETAIL

SCALE: 3/8"=1'-0"



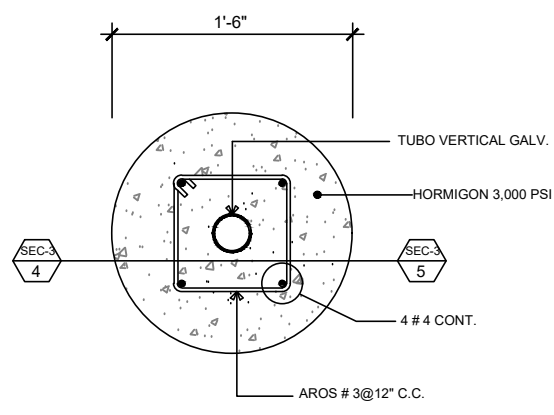
CHAIN LINK FENCE POST DETAIL

SCALE: 3/8"=1'-0"



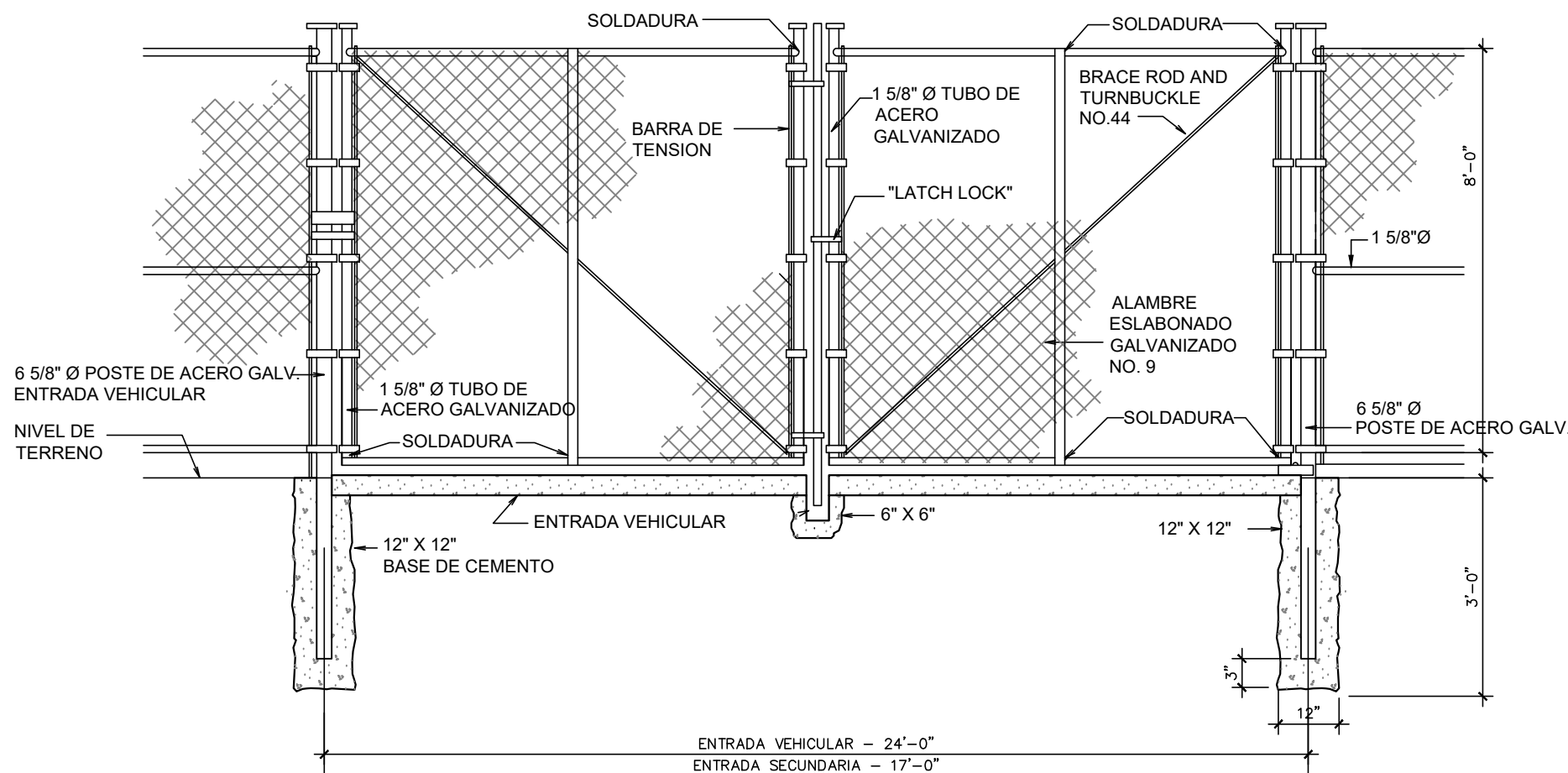
CHAIN LINK FENCE DETAIL

SCALE: 3/8"=1'-0"



CHAIN LINK FENCE POST DETAIL

SCALE: 3/8"=1'-0"

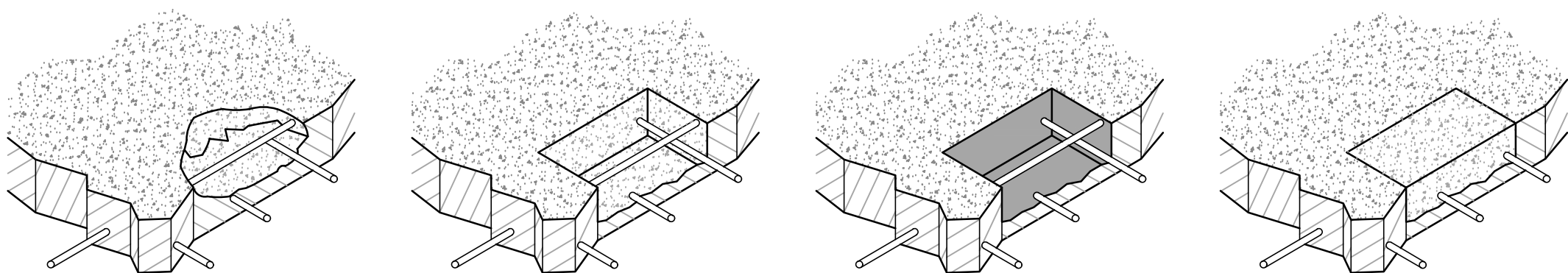


CHAINLINK FENCE VEHICULAR GATE DETAIL

SCALE: 3/8"=1'-0"

NOTES:

SPECIFIED PRODUCTS MAY BE REPLACED WITH EQUAL PRODUCTS.



DESPRENDIMIENTO SEVERO

PRIMER PASO

SEGUNDO PASO

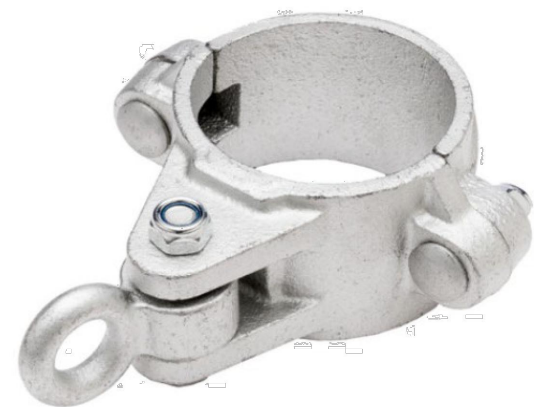
TERCER PASO

REPARACION DE LOSA O PAREDES DE CONCRETO SEVERA (ACERO CORROIDO)

1. La profundidad del daño en el concreto es mayor que 1/4" con perdida de agragados y varillas de refuerzo expuestas.
2. El primer paso es cortar con ciera el perimetro del daño, desastillar el concreto, exponer el refuerzo, remover el oxido y el plvo, limpiar con agua y eliminar cualquier sustancia que no permita la adeción de los materiales.
3. Segundo paso, se le aplicaran dos (2) capas de 10mil. de "SherCrete Rebar Coating & Bonding Agent" de Sherwin Williams (o similar a ser aprobado) donde ocurra y una (1) capa de este mismo producto (o similar a ser aprobado) al concreto existente. Se deben seguir todas las recomendaciones por parte manufacturero del producto aprobado a utilizarse.
4. Tercer paso, la excavación se debe rellenar y terminar según el estado original del edificio con el mortero "ShearCrete Repair Mortar" de Sherwin Williams (o similar a ser aprobado).

CONCRETE REPAIR DETAIL

SCALE: 3/4"=1'-0"



Swing Set Parts

Galvanized Ductile Iron Pipe Beam
Swing Hanger – diameter to match
existing swing set

Basic Commercial Belt Swing Seat
with 8'6" Plastisol Chain

- Swing Seat is 6" x 24" EPDM rubber
- High carbon steel spring inserts for strength and vandal resistance
- Sturdy galvanized triangle hardware riveted to seat

- Chain is 8'6" (102") in length and is partially plastisol coated for 30"
- Recommended chain length for swing beams that are 10-12 ft tall
- Chain comes assembled to swing with commercially rated S-Hooks

Equal or Similar to Playset Parts

SWING SET SEAT DETAIL

SCALE: NOT TO SCALE (FOR REFERENCE ONLY)

OWNER



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PROJECT

RIO ABAJO Y
URBANIZACION BUZO

HUMACAO, PR

DETAILS

DESIGNED BY:

D.MUÑIZ

DRAWING BY:

P.RESTO

CHECKED BY:

D.MUÑIZ

DATE:

3/10/2023

SCALE:

AS SHOWN

DRAWING ID

C-04

SHEET

5 OF XX

DETAILS:



McGraw-Edison

GALN Galleon II

Area / Site Luminaire

Product Features



Product Certifications



Interactive Menu

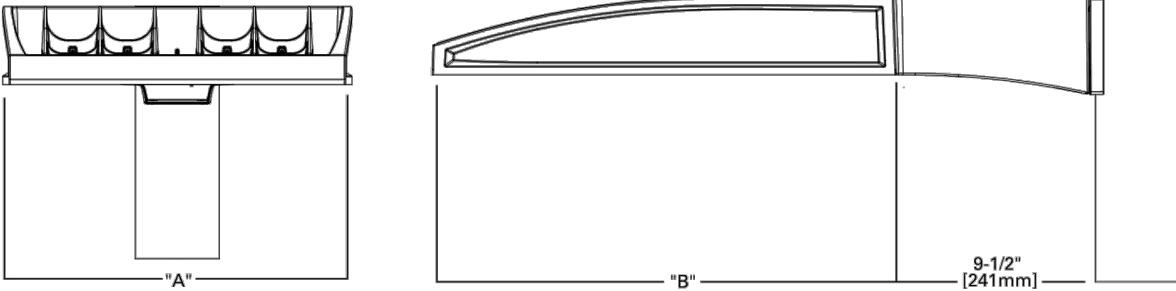
- Ordering Information page 2
- Mounting Details page 3
- Optical Distributions page 5
- Product Specifications page 5
- Energy and Performance Data page 6
- Control Options page 10

Quick Facts

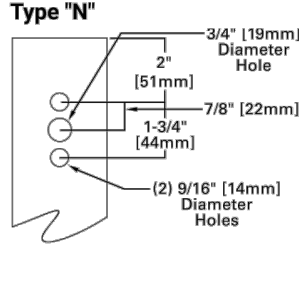
- Lumen packages range from 3,300 - 73,500 (33W - 552W)
- 16 optical distributions
- Efficacy up to 159 lumens per watt

Dimensional Details

Standard Arm



Pole Drilling Patterns



Number of Light Squares	Width "A"	Housing Length "B"	Weight with Standard or OM Arm	EPA with Standard or OM Arm
1-4	16"	22"	29 lb	0.95
5-6	22"	22"	39 lb	0.95
7-9	22"	28-1/8"	48 lb	1.1

NOTES:
For arm selection requirements and additional line art, see Mounting Details section.

NOTES:
1. Visit <https://www.dodgepanel.com/search/> to confirm qualification. Not all product variations are DLC qualified.
2. DLC Certified (2000K CCT and warmer only, fixed mounting options)

PS600052EN page 1
November 28, 2022 5:09 PM

PEDESTRIAN AREA LIGHT FIXTURE

SCALE: NOT IN SCALE (FOR REFERENCE ONLY)

AEON™
PNR SERIES

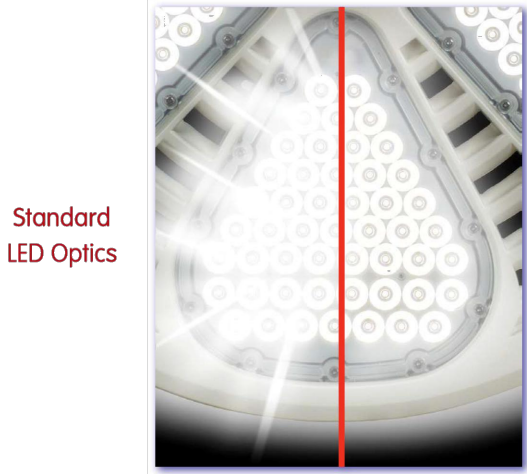
Enjoy a Drastic Reduction in your Monthly Utility Bill and Eliminate Costly Maintenance Expenses. AEON™...a Favorable Impact on your Bottom-Line.

AEON Model	Watts	Delivered Lumens	HID Equivalent	Energy Savings*	120V	277V	347V	480V	Net Weight	EPA (Sq. Ft.)
HL-APS-500WD	500W	69,200	1500W	67%	3.95A	1.71A	1.36A	0.98A	35 lbs. (15.9 Kg.)	1.85
HL-APS-750WD	750W	97,650	2000W	63%	6.5A	2.85A	2.25A	1.64A	40 lbs. (18.2 Kg.)	1.85

* Does not include Ballast Loss, Maintenance, Replacement Lamp Savings and Disposal Costs which amount to an additional Savings of 30-50%!

2 Popular Lumen Packages to Suit a Variety of Indoor and Outdoor Sports:

500W: 69,200lm (~1500W HID)
750W: 97,650lm (~2000W HID)



Standard LED Optics

AEON™
Proprietary
Glare-Free
LED Optics



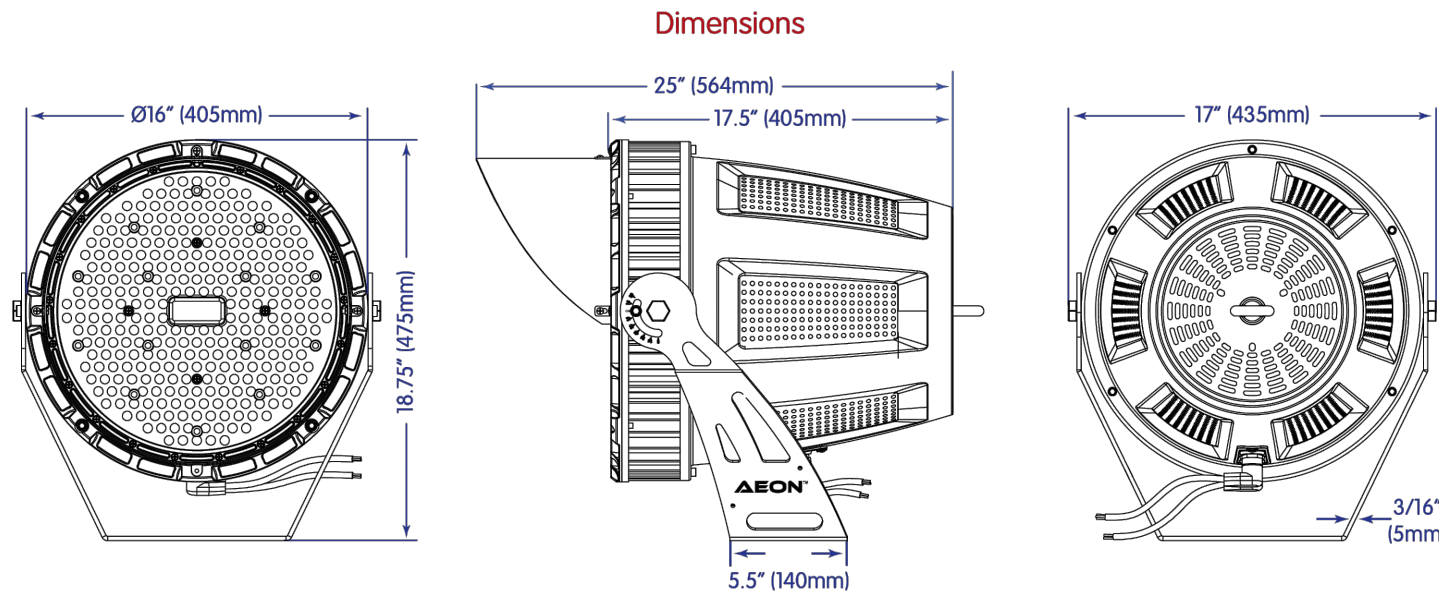
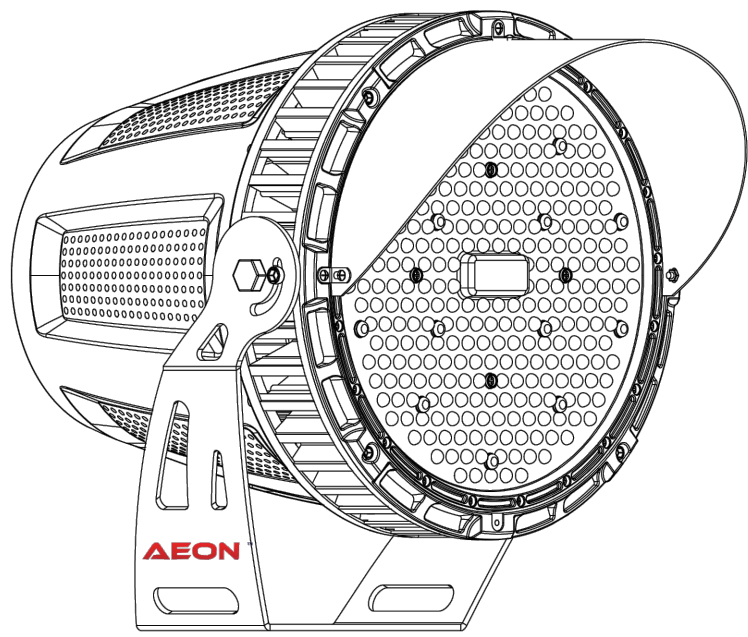
2-for-1
Replacement.
More Light
Less
Luminaires



AEON™
PNR SERIES

500W Beam Angle		
Distance	Max FC	Beam Diameter
33 ft.	74	26.8 ft.
66 ft.	19	53.6 ft.
99 ft.	8	80.5 ft.
133 ft.	5	108.1 ft.
200 ft.	2	162.5 ft.

750W Beam Angle		
Distance	Max FC	Beam Diameter
33 ft.	108	27.5 ft.
66 ft.	27	55.0 ft.
133 ft.	12	82.6 ft.
200 ft.	7	111.0 ft.
300 ft.	3	166.8 ft.



Ordering Nomenclature: HL-APS-500-K-277V-WH

HL	APS	500	K	277	WH
COMPANY	SERIES	WATTS	CCT	VOLTAGE	COLOR

500W
750WD

40K = 4000K
50K = 5000K
57K = 5700K

277V = 120V-277V
480V = 347V-480V

WH = White
GY = Gray
BK = Black

Important Note:
Standard CCT: 5000K
4000K & 5700K available as "Special Order" only and with Longer Lead Times

Important Note:
Standard Color: Signal White
Other Colors available as "Special Orders" only and with Longer Lead Times

As part of the company's continuous product improvement program, HyLite reserves the right to change materials or modify the design of its product without notification. All Specifications subject to change without notice. All values are design and/or typical values when measured under laboratory conditions. Actual Values depend upon the ambient temperature of the installation location. Please consult factory for your specific requirements.

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For more information, please visit: <https://aeonledlighting.com/>

010521

BASKETBALL COURT LIGHT FIXTURE

SCALE: NOT IN SCALE (FOR REFERENCE ONLY)

OWNER



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PROJECT

RIO ABAJO Y
URBANIZACION BUZO

HUMACAO, PR

LIGHT FIXTURES
DETAILS

DESIGNED BY:

D.MUÑOZ

DRAWING BY:

P.RESTO

CHECKED BY:

D.MUÑOZ

DATE:

3/10/2023

SCALE:

AS SHOWN

DRAWING ID

C-05

SHEET

5 OF XX

NOTES:

SPECIFIED PRODUCTS MAY BE REPLACED WITH EQUAL PRODUCTS.

PHOTOS:



PHOTO 1
SCALE: N.T.S




PHOTO 2
SCALE: N.T.S



PHOTO 3
SCALE: N.T.S


OWNER



DRD

DEPARTAMENTO DE RECREACIÓN Y DEPORTES

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PROJECT

RIO ABAJO Y
URBANIZACION BUZO

HUMACAO, PR

PHOTOS

DESIGNED BY:
D.MUÑIZ

DRAWING BY:
P.RESTO

CHECKED BY:
D.MUÑIZ

DATE:
3/10/2023

SCALE:
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DRAWING ID

C-06

SHEET
5 OF XX



FRACTAL ENGINEERING, PSC



DEPARTAMENTO DE RECREACIÓN Y DEPORTES DE P.R.
SECRETARÍA AUXILIAR DE INFRAESTRUCTURA
GOBIERNO DE PUERTO RICO

TECHNICAL SPECIFICATIONS
RIO ABAJO Y URB. BUZO, HUMACAO

FRACTAL ENGINEERS PSC

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TOTAL NUMBER OF PAGES: 175

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-- End of Project Table of Contents --

SECTION 02 41 00

DEMOLITION

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

AASHTO M 145 (1991; R 2012) Standard Specification for
Classification of Soils and Soil-Aggregate
Mixtures for Highway Construction Purposes

AASHTO T 180 (2017) Standard Method of Test for
Moisture-Density Relations of Soils Using
a 4.54-kg (10-lb) Rammer and a 457-mm
(18-in.) Drop

1.2 PROJECT DESCRIPTION

1.2.1 Definitions

1.2.1.1 Demolition

Demolition is the process of wrecking or taking out any load-supporting structural member of a facility together with any related handling and disposal operations.

1.2.1.2 Deconstruction

Deconstruction is the process of taking apart a facility with the primary goal of preserving the value of all useful building materials.

1.2.1.3 Demolition Plan

Demolition Plan is the planned steps and processes for managing demolition activities and identifying the required sequencing activities and disposal mechanisms.

1.2.1.4 Deconstruction Plan

Deconstruction Plan is the planned steps and processes for dismantling all or portions of a structure or assembly, to include managing sequencing activities, storage, re-installation activities, salvage and disposal mechanisms.

1.2.2 Demolition/Deconstruction Plan

Prepare a Demolition Plan and submit proposed demolition, and removal procedures for approval before work is started. Include in the plan

Technical Specifications

procedures for careful removal and disposition of materials specified to be salvaged, coordination with other work in progress, a disconnection schedule of utility services, a detailed description of methods and equipment to be used for each operation and of the sequence of operations. Coordinate with Waste Management Plan in accordance with the approved State Recycling Plan. Provide procedures for safe conduct of the work in accordance with PR OSHA. Plan shall be approved by Contracting Officer prior to work beginning.

1.2.3 General Requirements

Do not begin demolition or deconstruction until authorization is received from the Contracting Officer. Remove rubbish and debris from the project site; do not allow accumulations inside or outside the building.

1.3 ITEMS TO REMAIN IN PLACE

Take necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of the Government. Repair or replace damaged items as approved by the Contracting Officer. Coordinate the work of this section with all other work indicated. Construct and maintain shoring, bracing, and supports as required. Ensure that structural elements are not overloaded. Increase structural supports or add new supports as may be required as a result of any cutting, removal, deconstruction, or demolition work performed under this contract. Do not overload pavements to remain. Provide new supports and reinforcement for existing construction weakened by demolition, deconstruction, or removal work. Repairs, reinforcement, or structural replacement require approval by the Contracting Officer prior to performing such work.

1.3.1 Existing Construction Limits and Protection

Do not disturb existing construction beyond the extent indicated or necessary for installation of new construction. Provide temporary shoring and bracing for support of building components to prevent settlement or other movement. Provide protective measures to control accumulation and migration of dust and dirt in all work areas. Remove dust, dirt, and debris from work areas daily.

1.3.2 Trees

Protect trees within the project site which might be damaged during demolition or deconstruction, and which are indicated to be left in place, by a 6 foot high fence. Erect and secure fence a minimum of 5 feet from the trunk of individual trees or follow the outer perimeter of branches or clumps of trees. Replace any tree designated to remain that is damaged during the work under this contract with like-kind or as approved by the Contracting Officer.

1.3.3 Utility Service

Maintain existing utilities indicated to stay in service and protect against damage during demolition and deconstruction operations. Prior to start of work, utilities serving each area of alteration or removal will be shut off by the Government and disconnected and sealed by the Contractor

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1.3.4 Facilities

Protect electrical and mechanical services and utilities. Where removal of existing utilities and pavement is specified or indicated, provide approved barricades, temporary covering of exposed areas, and temporary services or connections for electrical and mechanical utilities. Floors, roofs, walls, columns, pilasters, and other structural components that are designed and constructed to stand without lateral support or shoring, and are determined to be in stable condition, must remain standing without additional bracing, shoring, or lateral support until demolished or deconstructed, unless directed otherwise by the Contracting Officer. Ensure that no elements determined to be unstable are left unsupported and place and secure bracing, shoring, or lateral supports as may be required as a result of any cutting, removal, deconstruction, or demolition work performed under this contract.

1.4 BURNING

The use of burning at the project site for the disposal of refuse and debris will not be permitted.

1.5 AVAILABILITY OF WORK AREAS

Areas in which the work is to be accomplished will be available in accordance with the following schedule:

Schedule	
Area	Date
Project Site	No requirement while performed during the project duration.

1.6 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.

SD-07 Certificates

PUI Approval; G

SD-11 Closeout Submittals

PGC Closeout

1.7 QUALITY ASSURANCE

Submit timely PUI Approval of demolition projects to Federal, State, regional, and local authorities. Notify the State's environmental protection agency, OGPe and the Contracting Officer in writing 10 working days prior to the commencement of work. Comply with federal, state, and local hauling and disposal regulations. Comply with the Environmental Protection Agency requirements specified. Use of explosives will not be permitted.

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1.7.1 Dust and Debris Control

Prevent the spread of dust and debris and avoid the creation of a nuisance or hazard in the surrounding area. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, flooding, or pollution. Sweep pavements as often as necessary to control the spread of debris that may result in foreign object damage potential to aircraft.

1.8 PROTECTION

1.8.1 Traffic Control Signs

a. Where pedestrian and driver safety is endangered in the area of removal work, use traffic barricades. Notify the Contracting Officer prior to beginning such work.

1.8.2 Protection of Personnel

Before, during and after the demolition work continuously evaluate the condition of the structure being demolished and take immediate action to protect all personnel working in and around the project site. No area, section, or component of floors, roofs, walls, columns, pilasters, or other structural element will be allowed to be left standing without sufficient bracing, shoring, or lateral support to prevent collapse or failure while workmen remove debris or perform other work in the immediate area.

1.9 RELOCATIONS

Perform the removal and reinstallation of relocated items as indicated with workmen skilled in the trades involved. Repair or replace items to be relocated which are damaged by the Contractor with new undamaged items as approved by the Contracting Officer.

1.10 EXISTING CONDITIONS

Before beginning any demolition or deconstruction work, survey the site and examine the drawings and specifications to determine the extent of the work. Record existing conditions in the presence of the Contracting Officer showing the condition of structures and other facilities adjacent to areas of alteration or removal. Digital Photographs and video will be acceptable as a record of existing conditions. Include in the record the elevation of the top of foundation walls, finish floor elevations, possible conflicting electrical conduits, plumbing lines, alarms systems, the location and extent of existing cracks and other damage and description of surface conditions that exist prior to before starting work. It is the Contractor's responsibility to verify and document all required outages which will be required during the course of work, and to note these outages on the record document. Submit survey results.

PART 2 PRODUCTS

2.1 FILL MATERIAL

a. Comply with excavating, backfilling, and compacting procedures for soils used as backfill material to fill basements, voids, depressions or excavations resulting from demolition or deconstruction of

Technical Specifications

structures.

- b. Fill material shall conform to the definition of satisfactory soil material as defined in AASHTO M 145, Soil Classification Groups A-1, A-2-4, A-2-5 and A-3. In addition, fill material shall be free from roots and other organic matter, trash, debris, frozen materials, and stones larger than 2 inches in any dimension.
- c. Proposed fill material must be sampled and tested by an approved soil testing laboratory, as follows:

Soil classification	AASHTO M 145
Moisture-density relations	AASHTO T 180, Method B or D

PART 3 EXECUTION

3.1 EXISTING FACILITIES TO BE REMOVED

Inspect and evaluate existing structures onsite for reuse. Existing construction scheduled to be removed for reuse shall be disassembled. Dismantled and removed materials are to be separated, set aside, and prepared as specified, and stored or delivered to a collection point for reuse, remanufacture, recycling, or other disposal, as specified. Materials shall be designated for reuse onsite whenever possible.

3.1.1 Structures

- a. Remove existing structures indicated to be removed to grade unless otherwise specified on plans.
- b. Demolish structures in a systematic manner from the top of the structure to the ground. Complete demolition work above each tier or floor before the supporting members on the lower level are disturbed.

3.1.2 Utilities and Related Equipment

3.1.2.1 General Requirements

Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by the Contracting Officer. Do not interrupt existing utilities serving facilities occupied and used by the Government except when approved in writing and then only after temporary utility services have been approved and provided. Do not begin demolition or deconstruction work until all utility disconnections have been made. Shut off and cap utilities for future use, as indicated.

3.1.2.2 Disconnecting Existing Utilities

Remove existing utilities uncovered by work and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Contracting Officer. When utility lines are encountered but are not indicated on the drawings, notify the Contracting Officer prior to further work in that area. Remove meters and related equipment and deliver to a location in accordance with instructions of the Contracting Officer.

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3.1.3 Chain Link Fencing

Remove chain link fencing, gates and other related salvaged items scheduled for removal and transport to designated areas. Remove gates as whole units. Cut chain link fabric to 30 foot lengths and store in rolls off the ground.

3.1.4 Paving and Slabs

Remove sawcut concrete and asphaltic concrete paving and slabs as indicated to a depth of 6 inches below existing adjacent grade. Provide neat sawcuts at limits of pavement removal as indicated. Pavement and slabs not to be used in this project shall be removed from the Installation at Contractor's expense.

3.1.5 Miscellaneous Metal

Salvage shop-fabricated items such as access doors and frames, steel gratings, metal ladders, wire mesh partitions, metal railings, metal windows and similar items as whole units. Salvage light-gage and cold-formed metal framing, such as steel studs, steel trusses, metal gutters, roofing and siding, metal toilet partitions, toilet accessories and similar items. Scrap metal shall become the Contractor's property. Recycle scrap metal as part of demolition and deconstruction operations. Provide separate containers to collect scrap metal and transport to a scrap metal collection or recycling facility, in accordance with the Waste Management Plan.

3.1.6 Patching

Where removals leave holes and damaged surfaces exposed in the finished work, patch and repair these holes and damaged surfaces to match adjacent finished surfaces, using on-site materials when available. Where new work is to be applied to existing surfaces, perform removals and patching in a manner to produce surfaces suitable for receiving new work. Finished surfaces of patched area shall be flush with the adjacent existing surface and shall match the existing adjacent surface as closely as possible as to texture and finish. Patching shall be as specified and indicated, and shall include:

3.2 CONCURRENT EARTH-MOVING OPERATIONS

Do not begin excavation, filling, and other earth-moving operations that are sequential to demolition or deconstruction work in areas occupied by structures to be demolished or deconstructed until all demolition and deconstruction in the area has been completed and debris removed. Fill holes, open basements and other hazardous openings.

3.3 DISPOSITION OF MATERIAL

3.3.1 Transportation Guidance

3.3.2 Unsalvageable and Non-Recyclable Material

Dispose of unsalvageable and non-recyclable noncombustible material in the disposal area located at the Contractor's disposal containers..

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3.4 CLEANUP

Remove debris and rubbish from basement and similar excavations. Remove and transport the debris in a manner that prevents spillage on streets or adjacent areas. Apply local regulations regarding hauling and disposal.

3.5 DISPOSAL OF REMOVED MATERIALS

3.5.1 Regulation of Removed Materials

Dispose of debris, rubbish, scrap, and other nonsalvageable materials resulting from removal operations with all applicable federal, state and local regulations as contractually specified in the Waste Management Plan . Storage of removed materials on the project site is prohibited.

3.5.2 Burning on Government Property

Burning of materials removed from demolished and deconstructed structures will not be permitted on Government property .

3.5.3 Removal from Government Property

Transport waste materials removed from demolished and deconstructed structures, except waste soil, from Government property for legal disposal. Dispose of waste soil as directed.

3.6 REUSE OF SALVAGED ITEMS

Recondition salvaged materials and equipment designated for reuse before installation. Replace items damaged during removal and salvage operations or restore them as necessary to usable condition.

-- End of Section --

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 117	(2010; Errata 2011) Specifications for Tolerances for Concrete Construction and Materials and Commentary
ACI 121R	(2008) Guide for Concrete Construction Quality Systems in Conformance with ISO 9001
ACI 301	(2016) Specifications for Structural Concrete
ACI 302.1R	(2015) Guide for Concrete Floor and Slab Construction
ACI 304R	(2000; R 2009) Guide for Measuring, Mixing, Transporting, and Placing Concrete
ACI 305R	(2010) Guide to Hot Weather Concreting
ACI 306R	(2016) Guide to Cold Weather Concreting
ACI 308.1	(2011) Specification for Curing Concrete
ACI SP-15	(2011) Field Reference Manual: Standard Specifications for Structural Concrete ACI 301-05 with Selected ACI References

AMERICAN HARDBOARD ASSOCIATION (AHA)

AHA A135.4	(1995; R 2004) Basic Hardboard
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ASTM INTERNATIONAL (ASTM)

ASTM A184	(2019) Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A615	(2020) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A767	(2016) Standard Specification for Zinc-Coated (Galvanized) Steel Bars for

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Concrete Reinforcement

ASTM A775	(2017) Standard Specification for Epoxy-Coated Steel Reinforcing Bars
ASTM A780	(2020) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A884	(2019) Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement
ASTM A934	(2016) Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
ASTM A955	(2020c) Standard Specification for Deformed and Plain Stainless-Steel Bars for Concrete Reinforcement
ASTM A970	(2018) Standard Specification for Headed Steel Bars for Concrete Reinforcement
ASTM A996	(2016) Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement
ASTM A1022	(2016b) Standard Specification for Deformed and Plain Stainless Steel Wire and Welded Wire for Concrete Reinforcement
ASTM A1044	(2016a) Standard Specification for Steel Stud Assemblies for Shear Reinforcement of Concrete
ASTM A1055	(2016) Standard Specification for Zinc and Epoxy Dual Coated Steel Reinforcing Bars
ASTM A1060	(2016b) Standard Specification for Zinc-Coated (Galvanized) Steel Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM A1064	(2017) Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM C31	(2019a) Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C33	(2018) Standard Specification for Concrete Aggregates
ASTM C39	(2020) Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

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ASTM C42	(2020) Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C78	(2018) Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
ASTM C94	(2020) Standard Specification for Ready-Mixed Concrete
ASTM C143	(2020) Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C150	(2020) Standard Specification for Portland Cement
ASTM C172	(2017) Standard Practice for Sampling Freshly Mixed Concrete
ASTM C173	(2016) Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C231	(2017a) Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260	(2010a; R 2016) Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C311	(2018) Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete
ASTM C330	(2017a) Standard Specification for Lightweight Aggregates for Structural Concrete
ASTM C494	(2019) Standard Specification for Chemical Admixtures for Concrete
ASTM C552	(2017; E 2018) Standard Specification for Cellular Glass Thermal Insulation
ASTM C578	(2019) Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
ASTM C591	(2020) Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
ASTM C595	(2020) Standard Specification for Blended Hydraulic Cements
ASTM C618	(2019) Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

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ASTM C803	(2018) Standard Test Method for Penetration Resistance of Hardened Concrete
ASTM C873	(2015) Standard Test Method for Compressive Strength of Concrete Cylinders Cast in Place in Cylindrical Molds
ASTM C900	(2015) Standard Test Method for Pullout Strength of Hardened Concrete
ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM C1012	(2018b) Standard Test Method for Length Change of Hydraulic-Cement Mortars Exposed to a Sulfate Solution
ASTM C1017	(2013; E 2015) Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C1074	(2011) Standard Practice for Estimating Concrete Strength by the Maturity Method
ASTM C1077	(2017) Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM C1157	(2020) Standard Performance Specification for Hydraulic Cement
ASTM C1218	(2020c) Standard Test Method for Water-Soluble Chloride in Mortar and Concrete
ASTM C1240	(2020) Standard Specification for Silica Fume Used in Cementitious Mixtures
ASTM C1260	(2014) Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1293	(2008; R 2015) Standard Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction
ASTM C1602	(2018) Standard Specification for Mixing Water Used in Production of Hydraulic Cement Concrete
ASTM D412	(2016) Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
ASTM D471	(2016a) Standard Test Method for Rubber Property - Effect of Liquids
ASTM D1751	(2004; E 2013; R 2013) Standard

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	Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D1752	(2018) Standard Specification for Preformed Sponge Rubber, Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D2628	(1991; R 2016) Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements
ASTM D2835	(1989; R 2017) Standard Specification for Lubricant for Installation of Preformed Compression Seals in Concrete Pavements
ASTM D5759	(2012; R 2020) Characterization of Coal Fly Ash and Clean Coal Combustion Fly Ash for Potential Uses
ASTM D6690	(2015) Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
ASTM E96	(2016) Standard Test Methods for Water Vapor Transmission of Materials
ASTM E1643	(2018a) Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs
ASTM E1745	(2017) Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs

CONCRETE REINFORCING STEEL INSTITUTE (CRSI)

CRSI 10MSP	(2018) Manual of Standard Practice
CRSI RB4.1	(2016) Supports for Reinforcement Used in Concrete

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST PS 1	(2009) DOC Voluntary Product Standard PS 1-07, Structural Plywood
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U.S. ARMY CORPS OF ENGINEERS (USACE)

COE CRD-C 513	(1974) Corps of Engineers Specifications for Rubber Waterstops
COE CRD-C 572	(1974) Corps of Engineers Specifications for Polyvinylchloride Waterstops

Technical Specifications

1.2 DEFINITIONS

- a. "Cementitious material" as used herein must include all portland cement, pozzolan, fly ash, slag cement, and silica fume.
- b. "Exposed to public view" means situated so that it can be seen from eye level from a public location after completion of the building. A public location is accessible to persons not responsible for operation or maintenance of the building.
- c. "Chemical admixtures" are materials in the form of powder or fluids that are added to the concrete to give it certain characteristics not obtainable with plain concrete mixes.
- d. "Supplementary cementing materials" (SCM) include coal fly ash, silica fume, slag cement, natural or calcined pozzolans, and ultra-fine coal ash when used in such proportions to replace the portland cement that result in improvement to sustainability and durability and reduced cost.
- e. "Design strength" (f'_c) is the specified compressive strength of concrete at time(s) specified in this section to meet structural design criteria.
- f. "Mass Concrete" is any concrete system that approaches a maximum temperature of 158 degrees F within the first 72 hours of placement. In addition, it includes all concrete elements with a section thickness of 3 feet or more regardless of temperature.
- g. "Mixture proportioning" is the process of designing concrete mixture proportions to enable it to meet the strength, service life and constructability requirements of the project while minimizing the initial and life-cycle cost.
- h. "Mixture proportions" are the masses or volumes of individual ingredients used to make a unit measure (cubic meter or cubic yard) of concrete.
- i. "Pozzolan" is a siliceous or siliceous and aluminous material, which in itself possesses little or no cementitious value but will, in finely divided form and in the presence of moisture, chemically react with calcium hydroxide at ordinary temperatures to form compounds possessing cementitious properties.
- j. "Workability (or consistence)" is the ability of a fresh (plastic) concrete mix to fill the form/mould properly with the desired work (vibration) and without reducing the concrete's quality. Workability depends on water content, chemical admixtures, aggregate (shape and size distribution), cementitious content and age (level of hydration).

1.3 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

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SD-01 Preconstruction Submittals

Laboratory Accreditation; G

SD-03 Product Data

Joint Sealants; G

Joint Filler; G

Vapor Retarder and Vapor Barrier; G

Concrete Curing Materials; G

Reinforcement; G

Waterstops; G

Biodegradable Form Release Agent; G

SD-05 Design Data

Concrete Mix Design; G

Compressive Strength Tests; G

Slump Tests

]1.4 MODIFICATION OF REFERENCES

Accomplish work in accordance with ACI publications except as modified herein. Consider the advisory or recommended provisions to be mandatory. Interpret reference to the "Building Official," the "Structural Engineer," and the "Architect/Engineer" to mean the Contracting Officer.

1.5 DELIVERY, STORAGE, AND HANDLING

Follow ACI 301, ACI 304R and ASTM A934 requirements and recommendations. Do not deliver concrete until vapor retarder, vapor barrier, forms, reinforcement, embedded items, and chamfer strips are in place and ready for concrete placement. Do not store concrete curing compounds or sealers with materials that have a high capacity to adsorb volatile organic compound (VOC) emissions. Do not store concrete curing compounds or sealers in occupied spaces.

1.5.1 Reinforcement

Store reinforcement of different sizes and shapes in separate piles or racks raised above the ground to avoid excessive rusting. Protect from contaminants such as grease, oil, and dirt. Ensure bar sizes can be accurately identified after bundles are broken and tags removed.

1.6 QUALITY ASSURANCE

1.6.1 Design Data

1.6.1.1 Concrete Mix Design

Sixty days minimum prior to concrete placement, submit a mix design for

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each strength and type of concrete. Submit a complete list of materials including type; brand; source and amount of cement, supplementary cementitious materials, fibers, and admixtures; and applicable reference specifications. Submit mill test and all other test for cement, supplementary cementitious materials, aggregates, and admixtures. Provide documentation of maximum nominal aggregate size, gradation analysis, percentage retained and passing sieve, and a graph of percentage retained versus sieve size. Provide mix proportion data using at least three different water-cementitious material ratios for each type of mixture, which produce a range of strength encompassing those required for each type of concrete required. If source material changes, resubmit mix proportion data using revised source material. Provide only materials that have been proven by trial mix studies to meet the requirements of this specification, unless otherwise approved in writing by the Contracting Officer. Indicate clearly in the submittal where each mix design is used when more than one mix design is submitted. Resubmit data on concrete components if the qualities or source of components changes. For previously approved concrete mix designs used within the past twelve months, the previous mix design may be re-submitted without further trial batch testing if accompanied by material test data conducted within the last six months. Obtain mix design approval from the contracting officer prior to concrete placement.

1.6.2 Quality Control Plan

Develop and submit for approval a concrete quality control program in accordance with the guidelines of ACI 121R and as specified herein. The plan must include approved laboratories. Provide direct oversight for the concrete qualification program inclusive of associated sampling and testing. All quality control reports must be provided to the Contracting Officer, Quality Manager and Concrete Supplier. Maintain a copy of ACI SP-15 and CRSI 10MSP at project site.

1.6.3 Laboratory Qualifications for Concrete Qualification Testing

The concrete testing laboratory must have the necessary equipment and experience to accomplish required testing. The laboratory must meet the requirements of ASTM C1077 and be Cement and Concrete Reference Laboratory (CCRL) inspected.

1.6.4 Laboratory Accreditation

Laboratory and testing facilities must be provided by and at the expense of the Contractor. The laboratories performing the tests must be accredited in accordance with ASTM C1077, including ASTM C78 and ASTM C1260. The accreditation must be current and must include the required test methods, as specified. Furthermore, the testing must comply with the following requirements:

- a. **Aggregate Testing and Mix Proportioning:** Aggregate testing and mixture proportioning studies must be performed by an accredited laboratory and under the direction of a registered professional engineer in a U.S. state or territory competent in concrete materials who is competent in concrete materials and must sign all reports and designs.
- b. **Acceptance Testing:** Furnish all materials, labor, and facilities required for molding, curing, testing, and protecting test specimens at the site and in the laboratory. Furnish and maintain boxes or other facilities suitable for storing and curing the specimens at the

Technical Specifications

site while in the mold within the temperature range stipulated by ASTM C31.

- c. Contractor Quality Control: All sampling and testing must be performed by an approved, onsite, independent, accredited laboratory.

PART 2 PRODUCTS

2.1 FORMWORK MATERIALS

- a. Form-facing material in contact with concrete must be lumber, plywood, metal, plastic, or treated paper that creates specified appearance and texture of concrete surface. Submit product information on proposed form-facing materials if different from that specified herein.
- b. Design formwork, shores, reshores, and backshores to support loads transmitted to them and to comply with applicable building code requirements.
- c. Design formwork and shoring for load redistribution resulting from stressing of post-tensioned reinforcement. Ensure that formwork allows movement resulting from application of prestressing force.
- d. Design formwork to withstand pressure resulting from placement and vibration of concrete and to maintain specified tolerances.
- e. Design formwork to accommodate waterstop materials in joints at locations indicated in Contract Documents.
- f. Provide temporary openings in formwork if needed to facilitate cleaning and inspection.
- g. Design formwork joints to inhibit leakage of mortar.
- h. Limit deflection of facing materials for concrete surfaces exposed to view to 1/240 of center-to-center spacing of facing supports.
- j. Submit product information on proposed form-facing materials if different from that specified herein.
- m. Submit procedure for reshoring and backshoring, including drawings signed and sealed by a licensed design engineer. Include on shop drawings the formwork removal procedure and magnitude of construction loads used for design of reshoring or backshoring system. Indicate in procedure the magnitude of live and dead loads assumed for required capacity of the structure at time of reshoring or backshoring.
- n. Submit manufacturer's product data on form liner proposed for use with each formed surface.

2.1.1 Wood Forms

Use lumber as specified in Section 06 10 00 ROUGH CARPENTRY and as follows. Provide lumber that is square edged or tongue-and-groove boards, free of raised grain, knotholes, or other surface defects. Provide plywood that complies with NIST PS 1, B-B concrete form panels or better or AHA A135.4, hardboard for smooth form lining.

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2.1.1.1 Concrete Form Plywood (Standard Rough)

Provide plywood that conforms to NIST PS 1, B-B, concrete form, not less than 5/8-inch thick.

2.1.1.2 Overlaid Concrete Form Plywood (Standard Smooth)

Provide plywood that conforms to NIST PS 1, B-B, high density form overlay, not less than 5/8-inch thick.

2.1.2 Plastic Forms

Plastic lumber as specified in Section 06 10 00 ROUGH CARPENTRY. Provide plastic forms that contain a minimum of 50 percent post-consumer recycled content, or a minimum of 50 percent post-industrial recycled content.

2.1.3 Carton Forms

Moisture resistant treated paper faces, biodegradable, structurally sufficient to support weight of wet concrete until initial set. Provide carton forms that contain a minimum of 5 percent post-consumer recycled content, or a minimum of 20 percent post-industrial recycled content.

2.1.4 Steel Forms

Provide steel form surfaces that do not contain irregularities, dents, or sags.

2.2 FORMWORK ACCESSORIES

- a. Use commercially manufactured formwork accessories, including ties and hangers.
- b. Form ties and accessories must not reduce the effective cover of the reinforcement.

2.2.1 Form Ties

- a. Use form ties with ends or end fasteners that can be removed without damage to concrete.
- b. Where indicated in Contract Documents, use form ties with integral water barrier plates or other acceptable positive water barriers in walls.
- c. The breakback distance for ferrous ties must be at least 3/4 in. for Surface Finish-2.0 or Surface Finish-3.0, as defined in ACI 301.
- d. If the breakback distance is less than 3/4 in., use coated or corrosion-resistant ties.
- e. Submit manufacturer's data sheet on form ties.

2.2.2 Waterstops

Submit manufacturer's data sheet on waterstop materials and splices.

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2.2.2.1 PVC Waterstop

Polyvinylchloride waterstops must conform to COE CRD-C 572.

2.2.2.2 Rubber Waterstop

Rubber waterstops must conform to COE CRD-C 513.

2.2.2.3 Thermoplastic Elastomeric Rubber Waterstop

Thermoplastic elastomeric rubber waterstops must conform to ASTM D471.

2.2.2.4 Hydrophilic Waterstop

Swellable strip type compound of polymer modified chloroprene rubber that swells upon contact with water must conform to the following requirements when tested in accordance to ASTM D412: Tensile strength 420 psi minimum; ultimate elongation 600 percent minimum. Hardness must be 50 minimum on the type A durometer and the volumetric expansion ratio in distilled water at 70 degrees F must be 3 to 1 minimum.

2.2.3 Biodegradable Form Release Agent

- a. Provide form release agent that is colorless, biodegradable, and soy oil-based , with a low (maximum of 55 grams/liter (g/l)) VOC content.
- b. Provide product that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
- c. Provide form release agent that reduces formwork moisture absorption, and does not contain diesel fuel, petroleum-based lubricating oils, waxes, or kerosene. Submit documentation indicating type of biobased material in product and biobased content. Indicate relative dollar value of biobased content products to total dollar value of products included in project.
- d. Submit manufacturer's product data on formwork release agent for use on each form-facing material.

2.2.4 Chamfer Materials

Use lumber materials with dimensions of 3/4 x 3/4 in.

2.2.5 Construction and movement joints

- a. Submit details and locations of construction joints in accordance with the requirements herein.
- b. Locate construction joints within middle one-third of spans of slabs, beams, and girders. If a beam intersects a girder within the middle one-third of girder span, the distance between the construction joint in the girder and the edge of the beam must be at least twice the width of the larger member.
- c. For members with post-tensioning tendons, locate construction joints where tendons pass through centroid of concrete section.
- d. Locate construction joints in walls and columns at underside of slabs,

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beams, or girders and at tops of footings or slabs.

- e. Make construction joints perpendicular to main reinforcement.
- f. Provide movement joints where indicated in Contract Documents or in accepted alternate locations.
- g. Submit location and detail of movement joints if different from those indicated in Contract Documents.
- h. Submit manufacturer's data sheet on expansion joint materials.
- i. Provide keyways where indicated in Contract Documents.

2.2.6 Perimeter Insulation

Perimeter insulation must be polystyrene conforming to ASTM C578, Type II; polyurethane conforming to ASTM C591, Type II; or cellular glass conforming to ASTM C552, Type I or IV. Comply with EPA requirements in accordance with Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING.

2.2.7 Other Embedded items

Use sleeves, inserts, anchors, and other embedded items of material and design indicated in Contract Documents.

2.3 CONCRETE MATERIALS

2.3.1 Cementitious Materials

2.3.1.1 Portland Cement

- a. Unless otherwise specified, provide cement that conforms to ASTM C150 Type
- b. Use one brand and type of cement for formed concrete having exposed-to-view finished surfaces.
- c. Submit information along with evidence demonstrating compliance with referenced standards. Submittals must include types of cementitious materials, manufacturing locations, shipping locations, and certificates showing compliance.
- d. Cementitious materials must be stored and kept dry and free from contaminants.

2.3.1.2 Fly Ash

- a. ASTM C618, Class F , except that the maximum allowable loss on ignition must not exceed 3 percent.
- b. Fly ash content must be a minimum of 30 percent by weight of cementitious material, provided the fly ash does not reduce the amount of cement in the concrete mix below the minimum requirements of local building codes. Where the use of fly ash cannot meet the minimum level, provide the maximum amount of fly ash permissible that meets the code requirements for cement content. Report the chemical analysis of the fly ash in accordance with ASTM C311. Evaluate and classify fly ash in accordance with ASTM D5759.

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2.3.1.3 Silica Fume

Silica fume must conform to ASTM C1240, including the optional limits on reactivity with cement alkalis. Silica fume may be furnished as a dry, densified material or as slurry. Proper mixing is essential to accomplish proper distribution of the silica fume and avoid agglomerated silica fume which can react with the alkali in the cement resulting in premature and extensive concrete damage. Supervision at the batch plant, finishing, and curing is essential. Provide at the Contractor's expense the services of a manufacturer's technical representative, experienced in mixing, proportioning, placement procedures, and curing of concrete containing silica fume. This representative must be present on the project prior to and during at least the first 4 days of concrete production and placement using silica fume. A High Range Water Reducing admixture (HRWRA) must be used with silica fume.

2.3.1.4 Other Supplementary Cementitious Materials

Natural pozzolan must be raw or calcined and conform to ASTM C618, Class N, including the optional requirements for uniformity and effectiveness in controlling ASR and must have an ignition loss not exceeding 3 percent. Class N pozzolan for use in mitigating ASR must have a Calcium Oxide (CaO) content of less than 13 percent and total equivalent alkali content less than 3 percent.

Ultra Fine Fly Ash (UFFA) and Ultra Fine Pozzolan (UFP) must conform to ASTM C618, Class F or N, and the following additional requirements:

- a. The strength activity index at 28 days of age must be at least 95 percent of the control specimens.
- b. The average particle size must not exceed 6 microns.
- c. The sum of $\text{SiO}_2 + \text{Al}_2\text{O}_3 + \text{Fe}_2\text{O}_3$ must be greater than 77 percent.

2.3.2 Water

- a. Water or ice must comply with the requirements of ASTM C1602.
- b. Minimize the amount of water in the mix. Improve workability by adjusting the grading of the aggregate and using admixture rather than by adding water.
- c. Water must be potable ; free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances deleterious to concrete.
- d. Protect mixing water and ice from contamination during storage and delivery.
- e. Submit test report showing water complies with ASTM C1602.

2.3.3 Aggregate

2.3.3.1 Normal-Weight Aggregate

- a. Aggregates must conform to ASTM C33.

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- b. Aggregates used in concrete must be obtained from the same sources and have the same size range as aggregates used in concrete represented by submitted field test records or used in trial mixtures.
- c.
- d. Store and handle aggregate in a manner that will avoid segregation and prevents contamination by other materials or other sizes of aggregates. Store aggregates in locations that will permit them to drain freely. Do not use aggregates that contain frozen lumps.
- e. Submit types, pit or quarry locations, producers' names, aggregate supplier statement of compliance with ASTM C33, and ASTM C1293 expansion data not more than 18 months old.

2.3.3.2 Lightweight Aggregate

Lightweight aggregate in accordance with ASTM C330.

2.3.3.3 Recycled Aggregate Materials

2.3.4 Admixtures

- a. Chemical admixtures must conform to ASTM C494.
- b. Air-entraining admixtures must conform to ASTM C260.
- c. Chemical admixtures for use in producing flowing concrete must conform to ASTM C1017.
- d. Do not use calcium chloride admixtures
- e. Use a corrosion-inhibiting admixture for concrete classified under exposure category C1 .
- f. Admixtures used in concrete must be the same as those used in the concrete represented by submitted field test records or used in trial mixtures.
- g. Protect stored admixtures against contamination, evaporation, or damage.
- h. To ensure uniform distribution of constituents, provide agitating equipment for admixtures used in the form of suspensions or unstable solutions. Protect liquid admixtures from freezing and from temperature changes that would adversely affect their characteristics.
- i. Submit types, brand names, producers' names, manufacturer's technical data sheets, and certificates showing compliance with standards required herein.

2.4 MISCELLANEOUS MATERIALS

2.4.1 Concrete Curing Materials

Provide concrete curing material in accordance with ACI 301 Section 5 and ACI 308.1 Section 2. Submit product data for concrete curing compounds. Submit manufactures instructions for placement of curing compound.

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2.4.2 Expansion/Contraction Joint Filler

ASTM D1751 or ASTM D1752 Type I or Type II. Material must be 1/2 inch thick, unless otherwise indicated.

2.4.3 Joint Sealants

Submit manufacturer's product data, indicating VOC content.

2.4.3.1 Horizontal Surfaces, 3 Percent Slope, Maximum

ASTM D6690 or ASTM C920, Type M, Class 25, Use T.

2.4.3.2 Vertical Surfaces Greater Than 3 Percent Slope

ASTM C920, Type M, Grade NS, Class 25, Use T ..

2.4.3.3 Preformed Polychloroprene Elastomeric Type

ASTM D2628.

2.4.3.4 Lubricant for Preformed Compression Seals

ASTM D2835.

2.4.4 Vapor Retarder and Vapor Barrier

ASTM E1745 Class C A polyethylene sheeting, minimum 10 mil thickness or other equivalent material with a maximum permeance rating of 0.04 perms per ASTM E96.

Consider plastic vapor retarders and adhesives with a high recycled content, low toxicity low VOC (Volatile Organic Compounds) levels.

2.4.5 Dovetail Anchor Slot

Preformed metal slot approximately 1 inch by 1 inch of not less than 22 gage galvanized steel cast in concrete. Coordinate actual size and throat opening with dovetail anchors and provide with removable filler material.

2.5 CONCRETE MIX DESIGN

2.5.1 Properties and Requirements

- a. Use materials and material combinations listed in this section and the contract documents.
- b. Cementitious material content must be adequate for concrete to satisfy the specified requirements for strength, w/cm, durability, and finishability described in this section and the contract documents.
- c. Selected target slump must meet the requirements this section, the contract documents, and must not exceed 9 in. Concrete must not show visible signs of segregation.
- d. The target slump must be enforced for the duration of the project. Determine the slump by ASTM C143. Slump tolerances must meet the requirements of ACI 117.

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- e. The nominal maximum size of coarse aggregate for a mixture must not exceed three-fourths of the minimum clear spacing between reinforcement, one-fifth of the narrowest dimension between sides of forms, or one-third of the thickness of slabs or toppings.
- f. Concrete must be air entrained for members assigned to Exposure Class F1, F2, or F3. The total air content must be in accordance with the requirements of the paragraph titled DURABILITY.
- g. Measure air content at the point of delivery in accordance with ASTM C173 or ASTM C231.
- h. Concrete for slabs to receive a hard-troweled finish must not contain an air-entraining admixture or have a total air content greater than 3 percent.
- i. Concrete properties and requirements for each portion of the structure are specified in the

2.5.2 Durability

2.5.2.1 Corrosion and Chloride Content

- a. Provide concrete meeting the requirements of the following table based on the exposure class assigned to members requiring protection against reinforcement corrosion in Contract Documents.
- b. Submit documentation verifying compliance with specified requirements.
- c. Water-soluble chloride ion content contributed from constituents including water, aggregates, cementitious materials, and admixtures must be determined for the concrete mixture by ASTM C1218 at age between 28 and 42 days.
- d. The maximum water-soluble chloride ion (Cl-) content in concrete, percent by mass of cement is as follows:

Exposure class	Maximum w/cm*	Minimum f'c, psi	Maximum water-soluble chloride ion (CL-) content in concrete, percent by mass of cement
Reinforced concrete			
C0	N/A	2500	1.00
C1	N/A	2500	0.30
C2		000	
Prestressed concrete			
C0	N/A	2500	0.06
C1	N/A	2500	0.06
C2	0.4	5000	0.06

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2.5.2.2 Sulfate Resistance

- a. Provide concrete meeting the requirements of the following table based on the exposure class assigned to members for sulfate exposure.

Exposure class	Maximum w/cm	Minimum f'c, psi	Required cementitious materials-types			Calcium chloride admixture
			ASTM	ASTM	ASTM	
S0	N/A	2500	N/A	N/A	N/A	No restrictions
S1	0.50	4000	II [*]	IP (MS); IS (<70) (MS); IT (MS)	MS	No restrictions
S2	0.45	4500	IV [^]	IP (HS); IS (<70) (HS); IT (HS)	HS	Not permitted
S3	0.45	4500	V + pozzolan or slag cement**	IP (HS) + pozzolan or slag cement [^] ; IS (<70) (HS) + pozzolan or slag cement [^] ; IT (HS) + pozzolan or slag cement**	HS + pozzolan or slag cement**	Not permitted

* For seawater exposure, other types of portland cements with tricalcium aluminate (C3A) contents up to 10 percent are acceptable if the w/cm does not exceed 0.40.

** The amount of the specific source of the pozzolan or slag cement to be used shall be at least the amount determined by test or service record to improve sulfate resistance when used in concrete containing Type V cement. Alternatively, the amount of the specific source of the pozzolan or slag used shall not be less than the amount tested in accordance with ASTM C1012 and meeting the requirements maximum expansion requirements listed herein.

[^] Other available types of cement, such as Type III or Type I, are acceptable in exposure classes S1 or S2 if the C3A contents are less than 8 or 5 percent, respectively.

- c. Alternative combinations of cementitious materials of those listed in this paragraph are acceptable if they meet the maximum expansion requirements listed in the following table:

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Exposure class	Maximum expansion when tested using ASTM C1012		
	At 6 months	At 6 months	At 18 months
S1	0.10 percent	N/A	N/A
S2	0.05 percent	0.10 percent^	N/A
S3	N/A	N/A	0.10 percent

^The 12-month expansion limit applies only when the measured expansion exceeds the 6-month maximum expansion limit.

2.5.2.3 Concrete permeability

- a. Provide concrete meeting the requirements of the following table based on exposure class assigned to members requiring low permeability in the Contract Documents.

Exposure class	Maximum w/cm*	Minimum f'c, psi	Additional minimum requirements
W0	N/A	2500	None
W1	0.5	4000	None

*The maximum w/cm limits do not apply to lightweight concrete.

- b. Submit documentation verifying compliance with specified requirements.

2.5.3 Contractor's Option for Material Only

2.5.4 Ready-Mix Concrete

Provide concrete that meets the requirements of ASTM C94.

Ready-mixed concrete manufacturer must provide duplicate delivery tickets with each load of concrete delivered. Provide delivery tickets with the following information in addition to that required by ASTM C94:

- a. Type and brand cement
- b. Cement and supplementary cementitious materials content in 94-pound bags per cubic yard of concrete
- c. Maximum size of aggregate
- d. Amount and brand name of admixtures
- e. Total water content expressed by water cementitious material ratio

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2.6 REINFORCEMENT

- a. Bend reinforcement cold. Fabricate reinforcement in accordance with fabricating tolerances of ACI 117.
- b. When handling and storing coated reinforcement, use equipment and methods that do not damage the coating. If stored outdoors for more than 2 months, cover coated reinforcement with opaque protective material.
- c. Submit manufacturer's certified test report for reinforcement.
- e. Submit request with locations and details of splices not indicated in Contract Documents.
- h. Submit request for field cutting, including location and type of bar to be cut and reason field cutting is required.

2.6.1 Reinforcing Bars

- a. Reinforcing bars must be deformed, except spirals, load-transfer dowels, and welded wire reinforcement, which may be plain.
- b. ASTM A615 with the bars marked S, Grade 60 ; or ASTM A996 with the bars marked R, Grade 60, or marked A, Grade 60.
- c.
- d. Submit mill certificates for reinforcing bars.

2.6.1.1 Galvanized Reinforcing Bars

- a. Provide zinc-coated (galvanized) reinforcing bars that conform to ASTM A767, as required by the contract Documents.
- b. Coating damage incurred during shipment, handling, and placing of zinc-coated (galvanized) reinforcing bars must be repaired in accordance with ASTM A780. Damaged areas must not exceed 2 percent of surface area in each linear foot of each bar or bar must not be used. The 2 percent limit on maximum allowed damaged coating area must include previously repaired areas damaged before shipment as required by ASTM A767.

2.6.1.2 Epoxy-Coated Reinforcing Bars

- a. Provide epoxy-coated reinforcing bars that conform to ASTM A775, Grade 60 .
- b. Coatings must be applied in plants that are certified in accordance with Concrete Reinforcing Steel Institute (CRSI) Epoxy Coating Plant Certification Program or an equivalent program acceptable to the contracting officer.
- c. Coating damage incurred during shipment, storage, handling, and placing of epoxy-coated reinforcing bars must be repaired. Repair

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damaged coating areas with patching material conforming to ASTM A775 or ASTM A934 as applicable and in accordance with material manufacturer's written recommendations. Damaged coating area must not exceed 2 percent of surface area in each linear foot of each bar or bar must not be used. The 2 percent limit on damaged coating area must include repaired areas damaged before shipment as required by ASTM A775 or ASTM A934 as applicable. Fading of coating color shall not be cause for rejection of epoxy-coated reinforcing bars.

d. .

2.6.1.3 Dual-coated Reinforcing Bars

- a. Zinc and epoxy dual-coated reinforcing bars must conform to ASTM A1055
- b. Coating damage incurred during shipment, storage, handling, and placing of zinc and epoxy dual-coated reinforcing bars must be repaired. Repair damaged coating areas with patching material conforming to ASTM A1055 and in accordance with material manufacturer's written recommendations. Damaged coating area must not exceed 2 percent of surface area in each linear foot of each bar or bar must not be used. The 2 percent limit on damaged coating area must include repaired areas damaged before shipment as required by ASTM A1055. Fading of coating color shall not be cause for rejection of zinc and epoxy dual-coated reinforcing bars.

2.6.1.4 Stainless Steel Reinforcing Bars

Stainless steel bars must meet the requirements of ASTM A955.

2.6.1.5 Headed Reinforcing Bars

Headed reinforcing bars must conform to ASTM A970 including Annex A1, and other specified requirements.

2.6.1.6 Bar Mats

- a. Bar mats must conform to ASTM A184.
- b. If coated bar mats are required, repair damaged coating as required in the paragraph titled GALVANIZED REINFORCING BARS EPOXY-COATED REINFORCING BARS and DUAL-COATED REINFORCING BARS.

2.6.1.7 Headed Shear Stud Reinforcement

Headed studs and headed stud assemblies must conform to ASTM A1044.

2.6.2 Mechanical Reinforcing Bar Connectors

- a. Provide 125 percent minimum yield strength of the reinforcement bar.
- b. Mechanical splices for galvanized reinforcing bars must be galvanized or coated with dielectric material.
- c. Mechanical splices used with epoxy-coated or dual-coated reinforcing bars must be coated with dielectric material.
- d. Submit data on mechanical splices demonstrating compliance with this paragraph.

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2.6.3 Wire

- a. Provide flat sheets of welded wire reinforcement for slabs and toppings.
- b. Plain or deformed steel wire must conform to ASTM A1064.
- c. Stainless steel wire must conform to ASTM A1022.
- d. Epoxy-coated wire must conform to ASTM A884. Coating damage incurred during shipment, storage, handling, and placing of epoxy-coated wires must be repaired. Repair damaged coating areas with patching material in accordance with material manufacturer's written recommendations. If damaged area exceeds 2 percent of surface area in each linear foot of each wire, wire must not be used. The 2 percent limit on damaged coating area must include repaired areas damaged before shipment as required by ASTM A884. Fading of coating color shall not be cause for rejection of epoxy-coated wire reinforcement.

2.6.4 Welded wire reinforcement

- a. Use welded wire reinforcement specified in Contract Documents and conforming to one or more of the specifications given herein.
- b. Plain welded wire reinforcement must conform to ASTM A1064, with welded intersections spaced no greater than 12 in. apart in direction of principal reinforcement.
- c. Deformed welded wire reinforcement must conform to ASTM A1064, with welded intersections spaced no greater than 16 in. apart in direction of principal reinforcement.
- d. Epoxy-coated welded wire reinforcement must conform to ASTM A884. Coating damage incurred during shipment, storage, handling, and placing of epoxy-coated welded wire reinforcement must be repaired in accordance with ASTM A884. Repair damaged coating areas with patching material in accordance with material manufacturer's written recommendations. If damaged area exceeds 2 percent of surface area in each linear foot of each wire or welded wire reinforcement, the sheet containing the damaged area must not be used. The 2 percent limit on damaged coating area must include repaired areas damaged before shipment as required by ASTM A884. Fading of coating color shall not be cause for rejection of epoxy-coated welded wire reinforcement.
- e. Stainless steel welded wire reinforcement must conform to ASTM A1022.
- f. Zinc-coated (galvanized) welded wire reinforcement must conform to ASTM A1060. Coating damage incurred during shipment, storage, handling, and placing of zinc-coated (galvanized) welded wire reinforcement must be repaired in accordance with ASTM A780. If damaged area exceeds 2 percent of surface area in each linear foot of each wire or welded wire reinforcement, the sheet containing the damaged area must not be used. The 2 percent limit on damaged coating area shall include repaired areas damaged before shipment as required by ASTM A1060.

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2.6.5 Reinforcing Bar Supports

- a. Provide reinforcement support types within structure as required by Contract Documents. Reinforcement supports must conform to CRSI RB4.1. Submit description of reinforcement supports and materials for fastening coated reinforcement if not in conformance with CRSI RB4.1.
- b. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar support.
- c. Legs of supports in contact with formwork must be hot-dip galvanized, or plastic coated after fabrication, or stainless-steel bar supports.
- d.

2.6.6 Reinforcing Fibers

PART 3 EXECUTION

3.1 EXAMINATION

- a. Do not begin installation until substrates have been properly constructed; verify that substrates are level.
- b. If substrate preparation is the responsibility of another installer, notify Contracting Officer of unsatisfactory preparation before processing.
- c. Check field dimensions before beginning installation. If dimensions vary too much from design dimensions for proper installation, notify Contracting Officer and wait for instructions before beginning installation.

3.2 PREPARATION

Determine quantity of concrete needed and minimize the production of excess concrete. Designate locations or uses for potential excess concrete before the concrete is poured.

3.2.1 General

- a. Surfaces against which concrete is to be placed must be free of debris, loose material, standing water, snow, ice, and other deleterious substances before start of concrete placing.
- b. Remove standing water without washing over freshly deposited concrete. Divert flow of water through side drains provided for such purpose.

3.2.2 Subgrade Under Foundations and Footings

- a. When subgrade material is semi-porous and dry, sprinkle subgrade surface with water as required to eliminate suction at the time concrete is deposited, or seal subgrade surface by covering surface with specified vapor retarder.
- b. When subgrade material is porous, seal subgrade surface by covering surface with specified vapor retarder.

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3.2.3 Subgrade Under Slabs on Ground

- a. Before construction of slabs on ground, have underground work on pipes and conduits completed and approved.
- b. Previously constructed subgrade or fill must be cleaned of foreign materials
- c. Finish surface of capillary water barrier under interior slabs on ground must not show deviation in excess of 1/4 inch when tested with a 10-foot straightedge parallel with and at right angles to building lines.
- d. Finished surface of subgrade or fill under exterior slabs on ground must not be more than 0.02-foot above or 0.10-foot below elevation indicated.

3.2.4 Edge Forms and Screed Strips for Slabs

- a. Set edge forms or bulkheads and intermediate screed strips for slabs to obtain indicated elevations and contours in finished slab surface and must be strong enough to support vibrating bridge screeds or roller pipe screeds if nature of specified slab finish requires use of such equipment.
- b. Align concrete surface to elevation of screed strips by use of strike-off templates or approved compacting-type screeds.

3.2.5 Reinforcement and Other Embedded Items

- a. Secure reinforcement, joint materials, and other embedded materials in position, inspected, and approved before start of concrete placing.
- b. When concrete is placed, reinforcement must be free of materials deleterious to bond. Reinforcement with rust, mill scale, or a combination of both will be considered satisfactory, provided minimum nominal dimensions, nominal weight, and minimum average height of deformations of a hand-wire-brushed test specimen are not less than applicable ASTM specification requirements.

3.3 FORMS

- a. Provide forms, shoring, and scaffolding for concrete placement. Set forms mortar-tight and true to line and grade.
- b. Chamfer above grade exposed joints, edges, and external corners of concrete 0.75 inch. Place chamfer strips in corners of formwork to produce beveled edges on permanently exposed surfaces.
- c. Provide formwork with clean-out openings to permit inspection and removal of debris.
- d. Inspect formwork and remove foreign material before concrete is placed.
- e. At construction joints, lap form-facing materials over the concrete of previous placement. Ensure formwork is placed against hardened concrete so offsets at construction joints conform to specified tolerances.

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- f. Provide positive means of adjustment (such as wedges or jacks) of shores and struts. Do not make adjustments in formwork after concrete has reached initial setting. Brace formwork to resist lateral deflection and lateral instability.
- g. Fasten form wedges in place after final adjustment of forms and before concrete placement.
- h. Provide anchoring and bracing to control upward and lateral movement of formwork system.
- i. Construct formwork for openings to facilitate removal and to produce opening dimensions as specified and within tolerances.
- j. Provide runways for moving equipment. Support runways directly on formwork or structural members. Do not support runways on reinforcement. Loading applied by runways must not exceed capacity of formwork or structural members.
- k. Position and support expansion joint materials, waterstops, and other embedded items to prevent displacement. Fill voids in sleeves, inserts, and anchor slots temporarily with removable material to prevent concrete entry into voids.
- l. Clean surfaces of formwork and embedded materials of mortar, grout, and foreign materials before concrete placement.

3.3.1 Coating

- a. Cover formwork surfaces with an acceptable material that inhibits bond with concrete.
- b. If formwork release agent is used, apply to formwork surfaces in accordance with manufacturer's recommendations before placing reinforcement. Remove excess release agent on formwork prior to concrete placement.
- c. Do not allow formwork release agent to contact reinforcement or hardened concrete against which fresh concrete is to be placed.

3.3.2 Reshoring

- a. Do not allow structural members to be loaded with combined dead and construction loads in excess of loads indicated in the accepted procedure.
- b. Install and remove reshores or backshores in accordance with accepted procedure.
- c. For floors supporting shores under newly placed concrete, either leave original supporting shores in place, or install reshores or backshores. Shoring system and supporting slabs must resist anticipated loads. Locate reshores and backshores directly under a shore position or as indicated on formwork shop drawings.
- d. In multistory buildings, place reshoring or backshoring over a sufficient number of stories to distribute weight of newly placed concrete, forms, and construction live loads.

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3.3.3 Reuse

- a. Reuse forms providing the structural integrity of concrete and the aesthetics of exposed concrete are not compromised.
- b. Wood forms must not be clogged with paste and must be capable of absorbing high water-cementitious material ratio paste.
- c. Remove leaked mortar from formwork joints before reuse.

3.3.4 Forms for Standard Rough Form Finish

Provide formwork in accordance with ACI 301 Section 5 with a surface finish, SF-1.0, for formed surfaces that are to be concealed by other construction.

3.3.5 Forms for Standard Smooth Form Finish

Provide formwork in accordance with ACI 301 Section 5 with a surface finish, SF-3.0, for formed surfaces that are exposed to view.

3.3.6 Form Ties

- a. For post-tensioned structures, do not remove formwork supports until stressing records have been accepted by the Contracting Officer.
- b. After ends or end fasteners of form ties have been removed, repair tie holes in accordance with ACI 301 Section 5 requirements.

3.3.7 Forms for Concrete Pan Joist Construction

Pan-form units for one-way or two-way concrete joist and slab construction must be factory-fabricated units of the approximate section indicated. Units must consist of steel or molded fiberglass concrete form pans. Closure units must be furnished as required.

3.3.8 Tolerances for Form Construction

- a. Construct formwork so concrete surfaces conform to tolerances in ACI 117.
- b. Position and secure sleeves, inserts, anchors, and other embedded items such that embedded items are positioned within ACI 117 tolerances.
- c. To maintain specified elevation and thickness within tolerances, install formwork to compensate for deflection and anticipated settlement in formwork during concrete placement. Set formwork and intermediate screed strips for slabs to produce designated elevation, camber, and contour of finished surface before formwork removal. If specified finish requires use of vibrating screeds or roller pipe screeds, ensure that edge forms and screed strips are strong enough to support such equipment.

3.3.9 Removal of Forms and Supports

- a. If vertical formed surfaces require finishing, remove forms as soon as removal operations will not damage concrete.

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- b. Remove top forms on sloping surfaces of concrete as soon as removal will not allow concrete to sag. Perform repairs and finishing operations required. If forms are removed before end of specified curing period, provide curing and protection.
- c. Do not damage concrete during removal of vertical formwork for columns, walls, and sides of beams. Perform needed repair and finishing operations required on vertical surfaces. If forms are removed before end of specified curing period, provide curing and protection.
- d. Leave formwork and shoring in place to support construction loads and weight of concrete in beams, slabs, and other structural members until in-place required strength of concrete is reached.
- e. Form-facing material and horizontal facing support members may be removed before in-place concrete reaches specified compressive strength if shores and other supports are designed to allow facing removal without deflection of supported slab or member.

3.3.10 Strength of Concrete Required for Removal of Formwork

If removal of formwork, reshoring, or backshoring is based on concrete reaching a specified in-place strength, mold and field-cure cylinders in accordance with ASTM C31. Test cylinders in accordance with ASTM C39. Alternatively, use one or more of the methods listed herein to evaluate in-place concrete strength for formwork removal.

- a. Tests of cast-in-place cylinders in accordance with ASTM C873. This option is limited to slabs with concrete depths from 5 to 12 in.
- b. Penetration resistance in accordance with ASTM C803.
- c. Pullout strength in accordance with ASTM C900.
- d. Maturity method in accordance with ASTM C1074. Submit maturity method data using project materials and concrete mix proportions used on the project to demonstrate the correlation between maturity and compressive strength of laboratory cured test specimens to the Contracting Officer.

3.4 WATERSTOP INSTALLATION AND SPLICES

- a. Provide waterstops in construction joints as indicated.
- b. Install formwork to accommodate waterstop materials. Locate waterstops in joints where indicated in Contract Documents. Minimize number of splices in waterstop. Splice waterstops in accordance with manufacturer's written instructions. Install factory-manufactured premolded mitered corners.
- c. Install waterstops to form a continuous diaphragm in each joint. Make adequate provisions to support and protect waterstops during progress of work. Protect waterstops protruding from joints from damage.

3.4.1 PVC Waterstop

Make splices by heat sealing the adjacent waterstop edges together using a thermoplastic splicing iron utilizing a non-stick surface specifically

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designed for waterstop welding. Reform waterstops at splices with a remolding iron with ribs or corrugations to match the pattern of the waterstop. The spliced area, when cooled, must show no signs of separation, holes, or other imperfections when bent by hand in as sharp an angle as possible.

3.4.2 Rubber Waterstop

Rubber waterstops must be spliced using cold bond adhesive as recommended by the manufacturer.

3.4.3 Thermoplastic Elastomeric Rubber Waterstop

Fittings must be shop made using a machine specifically designed to mechanically weld the waterstop. A portable power saw must be used to miter or straight cut the ends to be joined to ensure good alignment and contact between joined surfaces. Maintain continuity of the characteristic features of the cross section of the waterstop (for example ribs, tabular center axis, and protrusions) across the splice.

3.4.4 Hydrophilic Waterstop

Miter cut ends to be joined with sharp knife or shears. The ends must be adhered with adhesive.

3.5 PLACING REINFORCEMENT AND MISCELLANEOUS MATERIALS

- a. Unless otherwise specified, placing reinforcement and miscellaneous materials must be in accordance to ACI 301. Provide bars, welded wire reinforcement, wire ties, supports, and other devices necessary to install and secure reinforcement.
- b. Reinforcement must not have rust, 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.
- c. Nonprestressed cast-in-place concrete members must have concrete cover for reinforcement given in the following table:

Concrete Exposure	Member	Reinforcement	Specified cover, in.
Cast against and permanently in contact with ground	All	All	3

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Concrete Exposure	Member	Reinforcement	Specified cover, in.
Exposed to weather or in contact with ground	All	No. 6 through No. 18 bars	2
		No. 5 bar, W31 or D31 wire, and smaller	1-1/2
Not exposed to weather or in contact with ground	Slabs, joists, and walls	No. 14 and No. 18 bars	1-1/2
		No. 11 bar and smaller	3/4
	Beams, columns, pedestals, and tension ties	Primary reinforcement, stirrups, ties, spirals, and hoops	1-1/2

- d. Cast-in-place prestressed concrete members must have concrete cover for reinforcement, ducts, and end fittings given in the following table:

Concrete	Member	Reinforcement	Specified
Cast against and permanently in contact with ground	All	All	3
Exposed to weather or in contact with ground	Slabs, joists, and walls	All	1
	All other	All	1-1/2

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Concrete	Member	Reinforcement	Specified
Not exposed to weather or in contact with ground	Slabs, joists, and walls	All	3/4
	Beams, columns, and tension ties	Primary reinforcement	1-1/2
		Stirrups, ties, spirals, and hoops	1

- e. Precast nonprestressed or prestressed concrete members manufactured under plant conditions must have concrete cover for reinforcement, ducts, and end fittings given in the following table:

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Concrete Exposure	Member	Reinforcement	Specified cover, in.
Exposed to weather or in contact with ground	Walls	No. 14 and No. 18 bars; tendons larger than 1-1/2 in. diameter	1-1/2
		No. 11 bars and smaller; W31 and D31 wire, and smaller; tendons and strands 1-1/2 in.	3/4
	All other	No. 14 and No. 18 bars; tendons larger than 1-1/2 in.	2
		No. 6 through No. 11 bars; tendons and strands larger than 5/8 in. diameter through 1-1/2 in.	1-1/2
		No. 5 bar, W31 or D31 wire, and smaller; tendons and strands 5/8 in. diameter and smaller	1-1/4

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Concrete Exposure	Member	Reinforcement	Specified cover, in.
Not exposed to weather or in contact with ground	Slabs, joists, and walls	No. 14 and No. 18 bars; tendons larger than 1-1/2 in. diameter	1-1/4
		Tendons and strands 1-1/2 in. diameter and smaller	3/4
		No. 11 bar, W31 or D31	5/8
	Beams, columns, pedestals, and tension ties	Primary reinforcement	Greater of bar diameter and 5/8 and need not exceed 1-1/2
		Stirrups, ties, spirals, and hoops	3/8

3.5.1 General

Provide details of reinforcement that are in accordance with the Contract Documents.

3.5.2 Vapor Retarder and Vapor Barrier

- a. Install in accordance with ASTM E1643. Provide beneath the on-grade concrete floor slab. Use the greatest widths and lengths practicable to eliminate joints wherever possible. Lap joints a minimum of 12

inches and tape.

- b. Remove torn, punctured, or damaged vapor retarder and vapor barrier material and provide with new vapor retarder and vapor barrier prior to placing concrete. Concrete placement must not damage vapor retarder and vapor barrier material.

3.5.3 Perimeter Insulation

Install perimeter insulation at locations indicated. Adhesive must be used where insulation is applied to the interior surface of foundation walls and may be used for exterior application.

3.5.4 Reinforcement Supports

Provide reinforcement support in accordance with CRSI RB4.1 and ACI 301 Section 3 requirements. Supports for coated or galvanized bars must also be coated with electrically compatible material for a distance of at least 2 inches beyond the point of contact with the bars.

3.5.5 Epoxy Coated Reinforcing

Epoxy Coated Reinforcing must meet the requirements of ASTM A934 including Appendix X2, "Guidelines for Job Site Practices" except as otherwise specified herein.

3.5.5.1 Epoxy Coated Reinforcing Steel Placement and Coating Repair

Carefully handle and install bars to minimize job site patching. Use the same precautions as described in the paragraph titled EPOXY-COATED REINFORCING BARS. Do not drag bars over other bars or over abrasive surfaces. Keep bar free of dirt and grit. When possible, assemble reinforcement as tied cages prior to final placement into the forms. Support assembled cages on padded supports. It is not expected that coated bars, when in final position ready for concrete placement, are completely free of damaged areas; however, excessive nicks and scrapes which expose steel is cause for rejection. Criteria for defects which require repair and for those that do not require repair are as indicated. Inspect for defects and provide required repairs prior to assembly. After assembly, reinspect and provide final repairs.

- a. Immediately prior to application of the patching material, manually remove any rust and debonded coating from the reinforcement by suitable techniques employing devices such as wire brushes and emery paper. Exercise care during this surface preparation so that the damaged areas are not enlarged more than necessary to accomplish the repair. Clean damaged areas of dirt, debris, oil, and similar materials prior to application of the patching material.
- b. Do repair and patching in accordance with the patching material manufacturer's recommendations. These recommendations, including cure times, must be available at the job site at all times.
- c. Allow adequate time for the patching materials to cure in accordance with the manufacturer's recommendation prior to concrete placement.
- d. Rinse placed reinforcing bars with fresh water to remove chloride contamination prior to placing concrete.

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3.5.6 Splicing

As indicated in the Contract Documents. For splices not indicated follow ACI 301. Do not splice at points of maximum stress. Overlap welded wire reinforcement the spacing of the cross wires, plus 2 inches.

3.5.7 Future Bonding

Plug exposed, threaded, mechanical reinforcement bar connectors with a greased bolt. Provide bolt threads that match the connector. Countersink the connector in the concrete. Caulk the depression after the bolt is installed.

3.5.8 Setting Miscellaneous Material

Place and secure anchors and bolts, pipe sleeves, conduits, and other such items in position before concrete placement and support against displacement. Plumb anchor bolts and check location and elevation. Temporarily fill voids in sleeves with readily removable material to prevent the entry of concrete.

3.5.9 Fabrication

Shop fabricate reinforcing bars to conform to shapes and dimensions indicated for reinforcement, and as follows:

- a. Provide fabrication tolerances that are in accordance with ACI 117.
- b. Provide hooks and bends that are in accordance with the Contract Documents.

Reinforcement must be bent cold to shapes as indicated. Bending must be done in the shop. Rebending of a reinforcing bar that has been bent incorrectly is not be permitted. Bending must be in accordance with standard approved practice and by approved machine methods.

Deliver reinforcing bars bundled, tagged, and marked. Tags must be metal with bar size, length, mark, and other information pressed in by machine. Marks must correspond with those used on the placing drawings.

Do not use reinforcement that has any of the following defects:

- a. Bar lengths, depths, and bends beyond specified fabrication tolerances
- b. Bends or kinks not indicated on drawings or approved shop drawings
- c. Bars with reduced cross-section due to rusting or other cause

Replace defective reinforcement with new reinforcement having required shape, form, and cross-section area.

3.5.10 Placing Reinforcement

Place reinforcement in accordance with ACI 301.

For slabs on grade (over earth or over capillary water barrier) and for footing reinforcement, support bars or welded wire reinforcement on precast concrete blocks, spaced at intervals required by size of reinforcement, to keep reinforcement the minimum height specified above

the underside of slab or footing.

For slabs other than on grade, supports for which any portion is less than 1 inch from concrete surfaces that are exposed to view or to be painted must be of precast concrete units, plastic-coated steel, or stainless steel protected bar supports. Precast concrete units must be wedge shaped, not larger than 3-1/2 by 3-1/2 inches, and of thickness equal to that indicated for concrete protection of reinforcement. Provide precast units that have cast-in galvanized tie wire hooked for anchorage and blend with concrete surfaces after finishing is completed.

Provide reinforcement that is supported and secured together to prevent displacement by construction loads or by placing of wet concrete, and as follows:

- a. Provide supports for reinforcing bars that are sufficient in number and have sufficient strength to carry the reinforcement they support, and in accordance with ACI 301 and CRSI 10MSP. Do not use supports to support runways for concrete conveying equipment and similar construction loads.
- b. Equip supports on ground and similar surfaces with sand-plates.
- c. Support welded wire reinforcement as required for reinforcing bars.
- d. Secure reinforcements to supports by means of tie wire. Wire must be black, soft iron wire, not less than 16 gage.
- e. Reinforcement must be accurately placed, securely tied at intersections, and held in position during placing of concrete by spacers, chairs, or other approved supports. Point wire-tie ends away from the form. Unless otherwise indicated, numbers, type, and spacing of supports must conform to the Contract Documents.
- f. Bending of reinforcing bars partially embedded in concrete is permitted only as specified in the Contract Documents.

3.5.11 Spacing of Reinforcing Bars

- a. Spacing must be as indicated in the Contract Documents.
- b. Reinforcing bars may be relocated to avoid interference with other reinforcement, or with conduit, pipe, or other embedded items. If any reinforcing bar is moved a distance exceeding one bar diameter or specified placing tolerance, resulting rearrangement of reinforcement is subject to preapproval by the Contracting Officer.

3.5.12 Concrete Protection for Reinforcement

Additional concrete protection must be in accordance with the Contract Documents.

3.5.13 Welding

Welding must be in accordance with AWS D1.4/D1.4M.

3.6 BATCHING, MEASURING, MIXING, AND TRANSPORTING CONCRETE

In accordance with ASTM C94, ACI 301, ACI 302.1R and ACI 304R, except as

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modified herein. Batching equipment must be such that the concrete ingredients are consistently measured within the following tolerances: 1 percent for cement and water, 2 percent for aggregate, and 3 percent for admixtures. Furnish mandatory batch ticket information for each load of ready mix concrete.

3.6.1 Measuring

Make measurements at intervals as specified in paragraphs SAMPLING and TESTING.

3.6.2 Mixing

- a. Mix concrete in accordance with ASTM C94, ACI 301 and ACI 304R.
- b. Machine mix concrete. Begin mixing within 30 minutes after the cement has been added to the aggregates. Place concrete within 90 minutes of either addition of mixing water to cement and aggregates or addition of cement to aggregates if the air temperature is less than 84 degrees F.
- c. Reduce mixing time and place concrete within 60 minutes if the air temperature is greater than 84 degrees F except as follows: if set retarding admixture is used and slump requirements can be met, limit for placing concrete may remain at 90 minutes. Additional water may be added, provided that both the specified maximum slump and submitted water-cementitious material ratio are not exceeded and the required concrete strength is still met. When additional water is added, an additional 30 revolutions of the mixer at mixing speed is required.
- d. If the entrained air content falls below the specified limit, add a sufficient quantity of admixture to bring the entrained air content within the specified limits. Dissolve admixtures in the mixing water and mix in the drum to uniformly distribute the admixture throughout the batch. Do not reconstitute concrete that has begun to solidify.
- e. When fibers are used, add fibers together with the aggregates and never as the first component in the mixer. Fibers must be dispensed into the mixing system using appropriate dispensing equipment and procedure as recommended by the manufacturer.

3.6.3 Transporting

Transport concrete from the mixer to the forms as rapidly as practicable. Prevent segregation or loss of ingredients. Clean transporting equipment thoroughly before each batch. Do not use aluminum pipe or chutes. Remove concrete which has segregated in transporting and dispose of as directed.

3.7 PLACING CONCRETE

Place concrete in accordance with ACI 301 Section 5.

3.7.1 Footing Placement

Concrete for footings may be placed in excavations without forms upon inspection and approval by the Contracting Officer. Excavation width must be a minimum of 4 inches greater than indicated.

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3.7.2 Cold Weather

3.7.3 Hot Weather

Hot weather concrete must meet the requirements of ACI 301 unless otherwise specified. Maintain required concrete temperature using Figure 4.2 in ACI 305R to prevent the evaporation rate from exceeding 0.2 pound of water per square foot of exposed concrete per hour. Cool ingredients before mixing or use other suitable means to control concrete temperature and prevent rapid drying of newly placed concrete. Shade the fresh concrete as soon as possible after placing. Start curing when the surface of the fresh concrete is sufficiently hard to permit curing without damage. Provide water hoses, pipes, spraying equipment, and water hauling equipment, where job site is remote to water source, to maintain a moist concrete surface throughout the curing period. Provide burlap cover or other suitable, permeable material with fog spray or continuous wetting of the concrete when weather conditions prevent the use of either liquid membrane curing compound or impervious sheets. For vertical surfaces, protect forms from direct sunlight and add water to top of structure once concrete is set.

3.7.4 Bonding

Surfaces of set concrete at joints, must be roughened and cleaned of laitance, coatings, loose particles, and foreign matter. Roughen surfaces in a manner that exposes the aggregate uniformly and does not leave laitance, loosened particles of aggregate, nor damaged concrete at the surface.

Obtain bonding of fresh concrete that has set as follows:

- a. At joints between footings and walls or columns, between walls or columns and the beams or slabs they support, and elsewhere unless otherwise specified; roughened and cleaned surface of set concrete must be dampened, but not saturated, immediately prior to placing of fresh concrete.
- b. At joints in exposed-to-view work; at vertical joints in walls; at joints near midpoint of span in girders, beams, supported slabs, other structural members; in work designed to contain liquids; the roughened and cleaned surface of set concrete must be dampened but not saturated and covered with a cement grout coating.
- c. Provide cement grout that consists of equal parts of portland cement and fine aggregate by weight with not more than 6 gallons of water per sack of cement. Apply cement grout with a stiff broom or brush to a minimum thickness of 1/16 inch. Deposit fresh concrete before cement grout has attained its initial set.

3.8 WASTE MANAGEMENT

Provide as specified in the Waste Management Plan and as follows.

3.8.1 Mixing Equipment

Before concrete pours, designate Contractor-owned site meeting environmental standards for cleaning out concrete mixing trucks. Minimize

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water used to wash equipment.

3.8.2 Reinforcing Steel

Collect reinforcing steel and place in designated area for recycling.

3.8.3 Other Waste

Identify concrete manufacturer's or supplier's policy for collection or return of construction waste, unused material, deconstruction waste, and/or packaging material.

3.9 SURFACE FINISHES EXCEPT FLOOR, SLAB, AND PAVEMENT FINISHES

3.9.1 Defects

Repair surface defects in accordance with ACI 301 Section 5.

3.9.2 Not Against Forms (Top of Walls)

Surfaces not otherwise specified must be finished with wood floats to even surfaces. Finish must match adjacent finishes.

3.9.3 Formed Surfaces

3.9.3.1 Tolerances

Tolerances in accordance with ACI 117 and as indicated.

3.9.3.2 As-Cast Rough Form

Provide for surfaces not exposed to public view a surface finish SF-1.0. Patch holes and defects in accordance with ACI 301.

3.9.3.3 Standard Smooth Finish

Provide for surfaces exposed to public view a surface finish SF-3.0. Patch holes and defects in accordance with ACI 301.

3.10 FLOOR, SLAB, AND PAVEMENT FINISHES AND MISCELLANEOUS CONSTRUCTION

3.10.1 Finish

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.

3.10.1.1 Scratched

Use for surfaces intended to receive bonded applied cementitious applications. Finish concrete in accordance with ACI 301 Section 5 for a scratched finish.

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3.10.1.2 Floated

Use for exterior slabs where not otherwise specified. Finish concrete in accordance with ACI 301 Section 5 for a floated finish.

3.10.1.3 Steel Troweled

Use for floors intended as walking surfaces and for reception of floor coverings. Finish concrete in accordance with ACI 301 Section 5 for a steel troweled finish.

3.10.1.4 Nonslip Finish

Use on surfaces of exterior platforms, steps, and landings; and on exterior and interior pedestrian ramps. Finish concrete in accordance with ACI 301 Section 5 for a dry-shake finish. After the selected material has been embedded by the two floatings, complete the operation with a broomed finish.

3.10.1.5 Broomed

Use on surfaces of exterior walks, platforms, patios, and ramps, unless otherwise indicated. Finish concrete in accordance with ACI 301 Section 5 for a broomed finish.

3.10.2 Concrete Walks

Provide 4 inches thick minimum. Provide contraction joints spaced every 5 linear feet unless otherwise indicated. Cut contraction joints 1 inch deep, or one fourth the slab thickness whichever is deeper, with a jointing tool after the surface has been finished. Provide 0.5 inch thick transverse expansion joints at changes in direction where sidewalk abuts curb, steps, rigid pavement, or other similar structures; space expansion joints every 50 feet maximum. Give walks a broomed finish. Unless indicated otherwise, provide a transverse slope of 1/48. Limit variation in cross section to 1/4 inch in 5 feet.

3.10.3 Pits and Trenches

Place bottoms and walls monolithically or provide waterstops and keys.

3.10.4 Curbs and Gutters

Provide contraction joints spaced every 10 feet maximum unless otherwise indicated. Cut contraction joints 3/4 inch deep with a jointing tool after the surface has been finished. Provide expansion joints 1/2 inch thick and spaced every 100 feet maximum unless otherwise indicated. Perform pavement finish.

3.10.5 Splash Blocks

Provide at outlets of downspouts emptying at grade. Splash blocks may be precast concrete, and must be 24 inches long, 12 inches wide and 4 inches thick, unless otherwise indicated, with smooth-finished countersunk dishes sloped to drain away from the building.

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3.11 JOINTS

3.11.1 Construction Joints

Make and locate joints not indicated so as not to impair strength and appearance of the structure, as approved. Joints must be perpendicular to main reinforcement. Reinforcement must be continued and developed across construction joints. Locate construction joints as follows:

3.11.1.1 Maximum Allowable Construction Joint Spacing

- a. In walls at not more than 60 feet in any horizontal direction.
- b. In slabs on ground, so as to divide slab into areas not in excess of 1,200 square feet.

3.11.1.2 Construction Joints for Constructability Purposes

- a. In walls, at top of footing; at top of slabs on ground; at top and bottom of door and window openings or where required to conform to architectural details; and at underside of deepest beam or girder framing into wall.
- b. In columns or piers, at top of footing; at top of slabs on ground; and at underside of deepest beam or girder framing into column or pier.
- c. Near midpoint of spans for supported slabs, beams, and girders unless a beam intersects a girder at the center, in which case construction joints in girder must offset a distance equal to twice the width of the beam. Make transfer of shear through construction joint by use of inclined reinforcement.

Provide keyways at least 1-1/2-inches deep in construction joints in walls and slabs and between walls and footings; approved bulkheads may be used for slabs.

3.11.2 Isolation Joints in Slabs on Ground

- a. Provide joints at points of contact between slabs on ground and vertical surfaces, such as column pedestals, foundation walls, grade beams, and elsewhere as indicated.
- b. Fill joints with premolded joint filler strips 1/2 inch thick, extending full slab depth. Install filler strips at proper level below finish floor elevation with a slightly tapered, dress-and-oiled wood strip temporarily secured to top of filler strip to form a groove not less than 3/4 inch in depth where joint is sealed with sealing compound and not less than 1/4 inch in depth where joint sealing is not required. Remove wood strip after concrete has set. Contractor must clean groove of foreign matter and loose particles after surface has dried.

3.11.3 Contraction Joints in Slabs on Ground

- a. Provide joints to form panels as indicated.
- b. Under and on exact line of each control joint, cut 50 percent of welded wire reinforcement before placing concrete.

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- c. Sawcut contraction joints into slab on ground in accordance with ACI 301 Section 5.
- d. Joints must be 1/8-inch wide by 1/5 to 1/4 of slab depth and formed by inserting hand-pressed fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. After concrete has cured for at least 7 days, the Contractor must remove inserts and clean groove of foreign matter and loose particles.
- e. Sawcutting will be limited to within 12 hours after set and at 1/4 slab depth.

3.11.4 Sealing Joints in Slabs on Ground

- a. Contraction and control joints which are to receive finish flooring material must be sealed with joint sealing compound after concrete curing period. Slightly underfill groove with joint sealing compound to prevent extrusion of compound. Remove excess material as soon after sealing as possible.
- b. Sealed groove must be left ready to receive filling material that is provided as part of finish floor covering work.

3.12 CONCRETE FLOOR TOPPING

3.12.1 Standard Floor Topping

Provide topping for treads and platforms of metal steel stairs and elsewhere as indicated.

3.12.1.1 Preparations Prior to Placing

- a. When topping is placed on a green concrete base slab, screed surface of base slab to a level not more than 1-1/2 inches nor less than 1 inch below required finish surface. Remove water and laitance from surface of base slab before placing topping mixture. As soon as water ceases to rise to surface of base slab, place topping.
- b. When topping is placed on a hardened concrete base slab, remove dirt, loose material, oil, grease, asphalt, paint, and other contaminants from base slab surface, leaving a clean surface. Prior to placing topping mixture, 2-1/2-inches minimum, slab surface must be dampened and left free of standing water. Immediately before topping mixture is placed, broom a coat of neat cement grout onto surface of slab. Do not allow cement grout to set or dry before topping is placed.
- c. When topping is placed on a metal surface, such as metal pans for steel stairs, remove dirt, loose material, oil, grease, asphalt, paint, and other contaminants from metal surface.

3.12.1.2 Placing

Spread standard topping mixture evenly on previously prepared base slab or metal surface, brought to correct level with a straightedge, and struck off. Topping must be consolidated, floated, checked for trueness of surface, and refloated as specified for float finish.

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3.12.1.3 Finishing

Give trowel finish standard floor topping surfaces.

Give other finishes standard floor topping surfaces as indicated.

3.12.2 Heavy-Duty Floor Topping

Provide topping where indicated.

3.12.2.1 Heavy-duty Topping Mixture

Provide mixture that consists of 1 part portland cement and 2-1/2 parts emery aggregate or 1 part fine aggregate and 1-1/2 parts traprock coarse aggregate, by volume. Exact proportions of mixture must conform to recommendations of aggregate manufacturer. Mixing water must not exceed 3-1/4 gallons per 94-pound sack of cement including unabsorbed moisture in aggregate. Maximum slump must be 1 inch.

3.12.2.2 Base Slab

- a. Screed surface of slab to a level no more than 1-1/2 inches nor less than 1 inch below grade of finished floor.
- b. Give slab a scratch finish as specified.
- c. Preparations prior to placing.

Remove dirt, loose material, oil, grease, asphalt, paint and other contaminants from base slab surface. Prior to placing topping mixture, dampen slab surface and leave free of standing water. Immediately before topping mixture is placed, broom a coat of neat cement grout onto surface of slab. Allow cement grout to set or dry before topping mixture is placed.

3.12.2.3 Placing

Spread heavy-duty topping mixture evenly on previously prepared base slab, and bring to correct level with a straightedge, and strike off. Provide topping that is consolidated, floated, and checked for trueness of surface as specified for float finish, except that power-driven floats is the impact type.

3.12.2.4 Finishing

Give trowel finish heavy-duty floor topping surfaces. Provide trowel finish as specified, except that additional troweling after first power troweling must be not less than three hand-troweling operations.

3.13 CURING AND PROTECTION

Curing and protection in accordance with ACI 301 Section 5, unless otherwise specified. Begin curing immediately following form removal. Avoid damage to concrete from vibration created by blasting, pile driving, movement of equipment in the vicinity, disturbance of formwork or protruding reinforcement, and any other activity resulting in ground vibrations. Protect concrete from injurious action by sun, rain, flowing water, frost, mechanical injury, tire marks, and oil stains. Do not allow concrete to dry out from time of placement until the expiration of the

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specified curing period. Do not use membrane-forming compound on surfaces where appearance would be objectionable, on any surface to be painted, where coverings are to be bonded to the concrete, or on concrete to which other concrete is to be bonded. 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. Provide moist curing for those areas receiving liquid chemical sealer, hardener, or epoxy coating. Allow curing compound/sealer installations to cure prior to the installation of materials that adsorb VOCs.

3.13.1 Requirements for Type III, High-Early-Strength Portland Cement

The curing periods are required to be not less than one-fourth of those specified for portland cement, but in no case less than 72 hours.

3.13.2 Curing Periods

ACI 301 Section 5, except 10 days for retaining walls, pavement or chimneys. Begin curing immediately after placement. Protect concrete from premature drying, excessively hot temperatures, and mechanical injury; and maintain minimal moisture loss at a relatively constant temperature for the period necessary for hydration of the cement and hardening of the concrete. The materials and methods of curing are subject to approval by the Contracting Officer.

3.13.3 Curing Formed Surfaces

Accomplish curing of formed surfaces, including undersurfaces of girders, beams, supported slabs, and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed before end of curing period, accomplish final curing of formed surfaces by any of the curing methods specified above, as applicable.

3.13.4 Curing Unformed Surfaces

- a. Accomplish initial curing of unformed surfaces, such as monolithic slabs, floor topping, and other flat surfaces, by membrane curing.
- b. Accomplish final curing of unformed surfaces by any of curing methods specified, as applicable.
- c. Accomplish final curing of concrete surfaces to receive liquid floor hardener or finish flooring by moisture-retaining cover curing.

3.13.5 Temperature of Concrete During Curing

When temperature of atmosphere is 41 degrees F and below, maintain temperature of concrete at not less than 55 degrees F throughout concrete curing period or 45 degrees F when the curing period is measured by maturity. When necessary, make arrangements before start of concrete placing for heating, covering, insulation, or housing as required to maintain specified temperature and moisture conditions for concrete during curing period.

When the temperature of atmosphere is 80 degrees F and above or during other climatic conditions which cause too rapid drying of concrete, make arrangements before start of concrete placing for installation of wind breaks, of shading, and for fog spraying, wet sprinkling, or

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moisture-retaining covering of light color as required to protect concrete during curing period.

Changes in temperature of concrete must be uniform and not exceed 37 degrees F in any 1 hour nor 80 degrees F in any 24-hour period.

3.13.6 Protection from Mechanical Injury

During curing period, protect concrete from damaging mechanical disturbances, particularly load stresses, heavy shock, and excessive vibration and from damage caused by rain or running water.

3.13.7 Protection After Curing

Protect finished concrete surfaces from damage by construction operations.

3.14 FIELD QUALITY CONTROL

3.14.1 Sampling

ASTM C172. Collect samples of fresh concrete to perform tests specified. ASTM C31 for making test specimens.

3.14.2 Testing

3.14.2.1 Slump Tests

ASTM C143. Take concrete samples during concrete placement/discharge. The maximum slump may be increased as specified with the addition of an approved admixture provided that the water-cementitious material ratio is not exceeded. Perform tests at commencement of concrete placement, when test cylinders are made, and for each batch (minimum) or every 20 cubic yards (maximum) of concrete.

3.14.2.2 Temperature Tests

Test the concrete delivered and the concrete in the forms. Perform tests in hot or cold weather conditions (below 50 degrees F and above 80 degrees F) for each batch (minimum) or every 20 cubic yards (maximum) of concrete, until the specified temperature is obtained, and whenever test cylinders and slump tests are made.

3.14.2.3 Compressive Strength Tests

ASTM C39. Make six 6 inch by 12 inch test cylinders for each set of tests in accordance with ASTM C31, ASTM C172 and applicable requirements of ACI 305R and ACI 306R. Take precautions to prevent evaporation and loss of water from the specimen. Test two cylinders at 7 days, two cylinders at 28 days, and hold two cylinder in reserve. Take samples for strength tests of each mix design of concrete placed each day not less than once a day, nor less than once for each 100 cubic yards of concrete for the first 500 cubic yards, then every 500 cubic yards thereafter, nor less than once for each 5400 square feet of surface area for slabs or walls. For the entire project, take no less than five sets of samples and perform strength tests for each mix design of concrete placed. Each strength test result must be the average of two cylinders from the same concrete sample tested at 28 days. Concrete compressive tests must meet the requirements of this section, the Contract Document, and ACI 301. Retest locations represented by erratic core strengths. Where retest does

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not meet concrete compressive strength requirements submit a mitigation or remediation plan for review and approval by the contracting officer. Repair core holes with nonshrink grout. Match color and finish of adjacent concrete.

3.14.2.4 Strength of Concrete Structure

The strength of the concrete structure will be considered to be deficient if any of the following conditions are identified:

- a. Failure to meet compressive strength tests as evaluated.
- b. Reinforcement not conforming to requirements specified.
- c. Concrete which differs from required dimensions or location in such a manner as to reduce strength.
- d. Concrete curing and protection of concrete against extremes of temperature during curing, not conforming to requirements specified.
- e. Concrete subjected to damaging mechanical disturbances, particularly load stresses, heavy shock, and excessive vibration.
- f. Poor workmanship likely to result in deficient strength.

Where the strength of the concrete structure is considered deficient submit a mitigation or remediation plan for review and approval by the contracting officer.

3.14.2.5 Non-Conforming Materials

Factors that indicate that there are non-conforming materials include (but not limited to) excessive compressive strength, inadequate compressive strength, excessive slump, excessive voids and honeycombing, concrete delivery records that indicate excessive time between mixing and placement, or excessive water was added to the mixture during delivery and placement. Any of these indicators alone are sufficient reason for the Contracting Officer to request additional sampling and testing.

Investigations into non-conforming materials must be conducted at the Contractor's expense. The Contractor must be responsible for the investigation and must make written recommendations to adequately mitigate or remediate the non-conforming material. The Contracting Officer may accept, accept with reduced payment, require mitigation, or require removal and replacement of non-conforming material at no additional cost to the Government.

3.14.2.6 Testing Concrete Structure for Strength

When there is evidence that strength of concrete structure in place does not meet specification requirements or there are non-conforming materials, make cores drilled from hardened concrete for compressive strength determination in accordance with ASTM C42, and as follows:

- a. Take at least three representative cores from each member or area of concrete-in-place that is considered potentially deficient. Location of cores will be determined by the Contracting Officer.
- b. Test cores after moisture conditioning in accordance with ASTM C42 if

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concrete they represent is more than superficially wet under service.

- c. Air dry cores, (60 to 80 degrees F with relative humidity less than 60 percent) for 7 days before test and test dry if concrete they represent is dry under service conditions.
- d. Strength of cores from each member or area are considered satisfactory if their average is equal to or greater than 85 percent of the 28-day design compressive strength of the class of concrete.

Fill core holes solid with patching mortar and finished to match adjacent concrete surfaces.

Correct concrete work that is found inadequate by core tests in a manner approved by the Contracting Officer.

3.15 REPAIR, REHABILITATION AND REMOVAL

Before the Contracting Officer accepts the structure the Contractor must inspect the structure for cracks, damage and substandard concrete placements that may adversely affect the service life of the structure. A report documenting these defects must be prepared which includes recommendations for repair, removal or remediation must be submitted to the Contracting Officer for approval before any corrective work is accomplished.

3.15.1 Crack Repair

Prior to final acceptance, all cracks in excess of 0.02 inches wide must be documented and repaired. The proposed method and materials to repair the cracks must be submitted to the Contracting Officer for approval. The proposal must address the amount of movement expected in the crack due to temperature changes and loading.

3.15.2 Repair of Weak Surfaces

Weak surfaces are defined as mortar-rich, rain-damaged, uncured, or containing exposed voids or deleterious materials. Concrete surfaces with weak surfaces less than 1/4 inch thick must be diamond ground to remove the weak surface. Surfaces containing weak surfaces greater than 1/4 inch thick must be removed and replaced or mitigated in a manner acceptable to the Contracting Officer.

3.15.3 Failure of Quality Assurance Test Results

Proposed mitigation efforts by the Contractor must be approved by the Contracting Officer prior to proceeding.

-- End of Section --

SECTION 05 12 00

STRUCTURAL STEEL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

AASHTO LRFD (8th Edition; 2017) Bridge Design
Specifications

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 207 (2016; R 2017) Certification Standard for
Steel Fabrication and Erection, and
Manufacturing of Metal Components

AISC 303 (2016) Code of Standard Practice for Steel
Buildings and Bridges

AISC 325 (2017) Steel Construction Manual

AISC 326 (2009) Detailing for Steel Construction

AISC 341 (2016) Seismic Provisions for Structural
Steel Buildings

AISC 360 (2016) Specification for Structural Steel
Buildings

AISC 420 (2010) Certification Standard for Shop
Application of Complex Protective Coating
Systems

AISC DESIGN GUIDE 10 (1997) Erection Bracing of Low-Rise
Structural Steel Buildings

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)

ANSI/ASNT CP-189 (2016) ASNT Standard for Qualification and
Certification of Nondestructive Testing
Personnel (ANSI/ASNT CP-105-2006)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B46.1 (2020) Surface Texture, Surface Roughness,
Waviness and Lay

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AMERICAN WELDING SOCIETY (AWS)

AWS A2.4	(2012) Standard Symbols for Welding, Brazing and Nondestructive Examination
AWS D1.1	(2020) Structural Welding Code - Steel
AWS D1.8	(2016) Structural Welding Code—Seismic Supplement
AWS QC1	(2016) Specification for AWS Certification of Welding Inspectors

ASTM INTERNATIONAL (ASTM)

ASTM A6	(2017a) Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
ASTM A29	(2020) Standard Specification for General Requirements for Steel Bars, Carbon and Alloy, Hot-Wrought
ASTM A36	(2019) Standard Specification for Carbon Structural Steel
ASTM A53	(2020) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A108	(2013) Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished
ASTM A123	(2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A193	(2020) Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service and Other Special Purpose Applications
ASTM A276	(2017) Standard Specification for Stainless Steel Bars and Shapes
ASTM A307	(2014; E 2017) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
ASTM A500	(2020) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A563	(2015) Standard Specification for Carbon and Alloy Steel Nuts
ASTM A668	(2020a) Standard Specification for Steel Forgings, Carbon and Alloy, for General

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Industrial Use

ASTM A780	(2020) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A992	(2020) Standard Specification for Structural Steel Shapes
ASTM A1085	(2015) Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS)
ASTM B695	(2004; R 2016) Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
ASTM C827	(2016) Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures
ASTM C1107	(2020) Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM F436	(2019) Standard Specification for Hardened Steel Washers Inch and Metric Dimensions
ASTM F844	(2007a; R 2013) Washers, Steel, Plain (Flat), Unhardened for General Use
ASTM F959	(2017a) Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners, Inch and Metric Series
ASTM F1136	(2011) Standard Specification for Zinc/Aluminum Corrosion Protective Coatings for Fasteners
ASTM F1554	(2018) Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
ASTM F2329	(2015) Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners
ASTM F2833	(2011; R 2017) Standard Specification for Corrosion Protective Fastener Coatings with Zinc Rich Base Coat and Aluminum Organic/Inorganic Type
ASTM F3125	(2019) Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions

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830 MPa and 1040 MPa Minimum Tensile
Strength

CRANE MANUFACTURERS ASSOCIATION OF AMERICA (CMAA)

CMAA 70 (2015) Specification for Top Running
Bridge and Gantry Type Multiple Girder
Electric Overhead Traveling Cranes

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC PA 1 (2016) Shop, Field, and Maintenance
Coating of Metals

SSPC Paint 20 (2019) Zinc-Rich Primers (Type I,
Inorganic, and Type II, Organic)

SSPC Paint 29 (2002; E 2004) Zinc Dust Sacrificial
Primer, Performance-Based

SSPC SP 3 (2018) Power Tool Cleaning

SSPC SP 6/NACE No.3 (2007) Commercial Blast Cleaning

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-301-01 (2019) Structural Engineering

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR Part 1926, Subpart R Steel Erection

1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.

PROCEDURES:

SD-01 Preconstruction Submittals

Erection and Erection Bracing Drawings; G

SD-02 Shop Drawings

Fabrication Drawings Including Details of Connections; G

SD-03 Product Data

Shop Primer

Welding Electrodes and Rods

Non-Shrink Grout

SD-06 Test Reports

Weld Inspection Reports

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SD-07 Certificates

Steel

AISC Structural Steel Fabricator Quality Certification

AISC Structural Steel Erector Quality Certification

1.3 AISC QUALITY CERTIFICATION

Work must be fabricated by an AISC Certified Structural Steel Fabricator, in accordance with AISC 207, Category BU. Submit AISC Structural Steel Fabricator quality certification.

Work must be erected by an AISC Structural Steel Certified Erector, in accordance with AISC 207, Category CSE. Submit AISC Structural Steel erector quality certification.

]1.4 SEISMIC PROVISIONS

Provide the structural steel system in accordance with AISC 341, Chapter J as amended by UFC 3-301-01.

1.5 QUALITY ASSURANCE

1.5.1 Preconstruction Submittals

1.5.1.1 Erection and Erection Bracing Drawings

Submit for record purposes. Indicate the sequence of erection, temporary shoring and bracing. The erection drawings must conform to AISC 303. Erection drawings must be reviewed, stamped and sealed by a registered professional engineer.

1.5.2 Fabrication Drawing Requirements

Submit fabrication drawings for approval prior to fabrication. Prepare in accordance with AISC 303, AISC 326 and AISC 325. Fabrication drawings must not be reproductions of contract drawings. Sign and seal fabrication drawings by a registered professional engineer. Include complete information for the fabrication and erection of the structure's components, including the location, type, and size of bolts, welds, member sizes and lengths, connection details, blocks, copes, and cuts. Use AWS A2.4 standard welding symbols. Shoring and temporary bracing must be designed and sealed by a registered professional engineer and submitted for record purposes as part of the drawings. Clearly highlight any deviations from the details shown on the contract drawings highlighted on the fabrication drawings. Explain the reasons for any deviations from the contract drawings.

1.5.3 Delegated Connection Design

Design structural steel connection indicated in the contract documents per AISC 303, Option 3, using the connection loads indicated. Submit design calculations for steel connections signed and sealed by a registered professional engineer.

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1.5.4 Certifications

1.5.4.1 Welding Procedures and Qualifications

Prior to welding, submit certification for each welder stating the type of welding and positions qualified for, the code and procedure qualified under, date qualified, and the firm and individual certifying the qualification tests. If the qualification date of the welder or welding operator is more than 6 months old, the welding operator's qualification certificate must be accompanied by a current certificate by the welder attesting to the fact that he has been engaged in welding since the date of certification, with no break in welding service greater than 6 months.

Conform to all requirements specified in AWS D1.1 and AWS D1.8.

1.5.4.2 Overhead, Top Running Crane Rail Beam

Submit written field survey results for overhead, top running crane rail beam verifying tolerance requirements per CMAA 70.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Provide the structural steel system, including shop primer, complete and ready for use. Provide structural steel systems including design, materials, installation, workmanship, fabrication, assembly, erection, inspection, quality control, and testing in accordance with AISC 303, AISC 360, and UFC 3-301-01 except as modified in this contract.

2.2 STEEL

2.2.1 Structural Steel

Wide flange and WT shapes, ASTM A992. Angles, Channels and Plates, ASTM A36.

2.2.2 Structural Steel Tubing

ASTM A500, Grade B. ASTM A1085.

2.2.3 Steel Pipe

ASTM A53, Type E or S, Grade B, weight class STD (Standard) or as indicated.

2.3 BOLTS, NUTS, AND WASHERS

Submit the certified manufacturer's mill reports which clearly show the applicable ASTM mechanical and chemical requirements together with the actual test results for the supplied fasteners.

2.3.1 Common Grade Bolts

2.3.1.1 Bolts

ASTM A307, Grade A, plain finish hot dipped zinc coating. The bolt heads and the nuts of the supplied fasteners must be marked with the manufacturer's identification mark, the strength grade and type specified

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by ASTM specifications.

2.3.1.2 Nuts

ASTM A563, Grade A, heavy hex style.

2.3.1.3 Self-Locking Nuts

Provide nuts with a locking pin set in the nut. The locking pin must slide along the bolt threads, and by reversing the direction of the locking pin, the nut can be removed without damaging the nut or bolt. Provide stainless steel locking pins.

2.3.1.4 Washers

ASTM F844.

2.3.2 High-Strength Bolts

High strength bolts and nuts must be shipped together in the same shipping container. Fasteners indicated to be galvanized shall be tested by the supplier to show that the galvanized nut with the supplied lubricant provided may be rotated from the snug tight condition well in excess of the rotation required for pretensioned installation without stripping. The supplier shall supply nuts that have been lubricated and tested with the supplied bolts.

2.3.2.1 Bolts

ASTM F3125, Grade A325M A325 , Type 1 Heavy Hex Head Style, plain finish hot dipped zinc coating.

2.3.2.2 Nuts

ASTM A563, Grade and Style as specified in the applicable ASTM bolt standard.

2.3.2.3 Direct Tension Indicator Washers

ASTM F959. Provide ASTM B695, Class 55, Type 1 galvanizing. Submit product data for direct tension indicator washers.

2.3.2.4 Washers

ASTM F436, plain carbon steel.

2.3.3 Tension Control Bolts

ASTM F3125, Grade F1852, Type 1, twistoff style assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon steel nuts, and hardened carbon steel washers. Assembly finish must be mechanically deposited zinc coating. Submit product data for tension control bolts.

2.3.4 Foundation Anchorage

2.3.4.1 Anchor Rods

ASTM F1554 Gr 36 55, Class 1A. Stainless steel ASTM A193.

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2.3.4.2 Anchor Nuts

ASTM A563, Grade A, hex style. Stainless steel ASTM A193.

2.3.4.3 Anchor Washers

ASTM F844. Stainless steel Type 304 conforming to ASTM A276.

2.3.4.4 Anchor Plate Washers

ASTM A36 Stainless steel Type 304 conforming to ASTM A276.

2.4 STRUCTURAL STEEL ACCESSORIES

2.4.1 Welding Electrodes and Rods

AWS D1.1 and AWS D1.8. Submit product data for welding electrodes and rods.

2.4.2 Non-Shrink Grout

ASTM C1107, with no ASTM C827 shrinkage. Grout must be nonmetallic. Submit product data for non-shrink grout.

2.4.3 Welded Shear Stud Connectors

ASTM A29, Grades 1010 through 1020. AWS D1.1, Table 7.1, Type B.

2.4.4 Pins and Rollers

ASTM A668, Class C, D, F, or G; ASTM A108, Grades 1016 to 1030. Provide as specified in AASHTO LRFD, Section 6.4.2, except provide pins in lengths to extend a minimum of 0.25 inch beyond the outside faces of the connected parts.

2.5 GALVANIZING

ASTM F2329, ASTM F1136, ASTM F2833 or ASTM B695 for threaded parts or ASTM A123 for structural steel members, as applicable, unless specified otherwise galvanize after fabrication where practicable.

2.6 FABRICATION

Fabrication must be in accordance with the applicable provisions of AISC 325. Fabrication and assembly must be done in the shop to the greatest extent possible. Punch, subpunch and ream, or drill bolt and pin holes perpendicular to the surface of the member.

Compression joints depending on contact bearing must have a surface roughness not in excess of 500 micro inch as determined by ASME B46.1, and ends must be square within the tolerances for milled ends specified in ASTM A6.

Shop splices of members between field splices will be permitted only where indicated on the Contract Drawings. Splices not indicated require the approval of the Contracting Officer.

Do not splice truss top and bottom chords except as approved by the Contracting Officer. Provide chord splices at panel joints at

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approximately the third point of the span. The center of gravity lines of truss members must intersect at panel points unless otherwise approved by the Contracting Officer. When the center of gravity lines do not intersect at a panel point, make provisions for the stresses due to eccentricity. Camber of trusses must be 1/8 inch in 10 feet unless otherwise indicated.

2.6.1 Markings

Prior to erection, identify members by a painted erection mark. Connecting parts assembled in the shop for reaming holes in field connections must be match marked with scratch and notch marks. Do not locate erection markings on areas to be welded. Do not locate match markings in areas that will decrease member strength or cause stress concentrations. Affix embossed tags to hot-dipped galvanized members.

2.6.2 Shop Primer

SSPC Paint 20 or SSPC Paint 29, (zinc rich primer). Shop prime structural steel, except as modified herein, in accordance with SSPC PA 1. Do not prime steel surfaces embedded in concrete, galvanized surfaces, or surfaces within 0.5 inch of the toe of the welds prior to welding (except surfaces on which metal decking and shear studs are to be welded). If flash rusting occurs, re-clean the surface prior to application of primer. Apply primer in accordance with endorsement "SPE-P1""SPE-P2" of AISC 420 or approved equal NACE or SSPC certification to a minimum dry film thickness of 2.0 mil. Submit shop primer product data.

Prime slip critical surfaces with a Class B coating in accordance with AISC 325. Submit test report for Class B coating.

Prior to assembly, prime surfaces which will be concealed or inaccessible after assembly. Do not apply primer in foggy or rainy weather; when the ambient temperature is below 45 degrees F or over 95 degrees F; or when the primer may be exposed to temperatures below 40 degrees F within 48 hours after application, unless approved otherwise by the Contracting Officer. Repair damaged primed surfaces with an additional coat of primer.

2.6.2.1 Cleaning

SSPC SP 6/NACE No.3, except steel exposed in spaces above ceilings, attic spaces, furred spaces, and chases that will be hidden to view in finished construction may be cleaned to SSPC SP 3 when recommended by the shop primer manufacturer. Maintain steel surfaces free from rust, dirt, oil, grease, and other contaminants through final assembly.

2.6.3 Epoxy Coated Surfaces

Clean and prepare surfaces to receive epoxy coatings in accordance with the manufacturer's recommendations, and as specified in Section 07 81 00 SPRAY-APPLIED FIREPROOFING.

2.7 DRAINAGE HOLES

Drill adequate drainage holes to eliminate water traps. Hole diameter must be 1/2 inch and location indicated on the detail drawings. Hole size and locations must not affect the structural integrity.

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PART 3 EXECUTION

3.1 ERECTION

- a. Erection of structural steel, except as indicated in item b. below, must be in accordance with the applicable provisions of AISC 325, AISC 303 and 29 CFR Part 1926, Subpart R.
- b. For low-rise structural steel buildings (60 feet tall or less and a maximum of 2 stories), erect the structure in accordance with AISC DESIGN GUIDE 10.

After final positioning of steel members, provide full bearing under base plates and bearing plates using nonshrink grout. Place nonshrink grout in accordance with the manufacturer's instructions.

3.1.1 STORAGE

Store the material out of contact with the ground in such manner and location as to minimize deterioration.

3.2 CONNECTIONS

Except as modified in this section, design connections indicated in accordance with AISC 360. Build connections into existing work. Do not tighten anchor bolts set in concrete with impact torque wrenches. Holes must not be cut or enlarged by burning. Bolts, nuts, and washers must be clean of dirt and rust, and lubricated immediately prior to installation.

3.2.1 Common Grade Bolts

Tighten ASTM A307 bolts to a "snug tight" fit. "Snug tight" is the tightness that exists when plies in a joint are in firm contact. If firm contact of joint plies cannot be obtained with a few impacts of an impact wrench, or the full effort of a man using a spud wrench, contact the Contracting Officer for further instructions.

3.2.2 High-Strength Bolts

Provide direct tension indicator washers in all ASTM F3125, Grade A325 and Grade A490 bolted connections. Bolts must be installed in connection holes and initially brought to a snug tight fit. After the initial tightening procedure, fully tension bolts, progressing from the most rigid part of a connection to the free edges.

Fastener components shall be protected from dirt and moisture in closed containers at the site of the installation. Fastener components that are not incorporated into the work shall be returned to protected storage at the end of the work shift.

3.2.2.1 Installation of Direct Tension Indicator Washers (DTIW)

Where possible, install the DTIW under the bolt head and tighten the nut. If the DTIW is installed adjacent to the turned element, provide a flat washer between the DTIW and nut when the nut is turned for tightening, and between the DTIW and bolt head when the bolt head is turned for tightening. In addition to the DTIW, provide flat washers under both the bolt head and nut when ASTM F3125, Grade A490 bolts are used.

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3.2.3 Tension Control Bolts

Bolts must be installed in connection holes and initially brought to a snug tight fit. After the initial tightening procedure, fully tension bolts, progressing from the most rigid part of a connection to the free edges.

3.3 GAS CUTTING

Use of gas-cutting torch in the field for correcting fabrication errors is not permitted on any major member in the structural framing. Use of a gas cutting torch will be permitted on minor members not under stress only after approval has been obtained from the Contracting Officer.

3.4 WELDING

Welding must be in accordance with AWS D1.1 and AWS D1.8. Grind exposed welds smooth as indicated. Provide AWS D1.1 qualified welders, welding operators, and tackers.

Develop and submit the Welding Procedure Specifications (WPS) for all welding, including welding done using prequalified procedures. Submit for approval all WPS, whether prequalified or qualified by testing.

3.4.1 Removal of Temporary Welds, Run-Off Plates, and Backing Strips

Remove only from finished areas. Remove backing strips from bottom flange of moment connections, backgouge the root pass to sound weld metal and reinforce with a 5/16 inch fillet weld minimum.

3.5 SHOP PRIMER REPAIR

Repair shop primer in accordance with the paint manufacturer's recommendation for surfaces damaged by handling, transporting, cutting, welding, or bolting.

3.5.1 Field Priming

Field prime steel exposed to the weather, or located in building areas without HVAC for control of relative humidity. After erection, the field bolt heads and nuts, field welds, and any abrasions in the shop coat must be cleaned and primed with paint of the same quality as that used for the shop coat.

3.6 GALVANIZING REPAIR

Repair damage to galvanized coatings using ASTM A780 zinc rich paint for galvanizing damaged by handling, transporting, cutting, welding, or bolting. Do not heat surfaces to which repair paint has been applied.

3.7 FIELD QUALITY CONTROL

Perform field tests, and provide labor, equipment, and incidentals required for testing. Notify the Contracting Officer in writing of defective welds, bolts, nuts, and washers within 7 working days of the date of the inspection.

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3.7.1 Welds

3.7.1.1 Visual Inspection

AWS D1.1/D1.1M. Furnish the services of AWS-certified welding inspectors for fabrication and erection inspection and testing and verification inspections. A Certified Welding Inspector must perform visual inspection on 100 percent of all welds. Document this inspection in the Visual Weld Inspection Log. Submit certificates indicating that certified welding inspectors meet the requirements of AWS QC1.

Inspect proper preparation, size, gaging location, and acceptability of all welds; identification marking; operation and current characteristics of welding sets in use.

3.7.1.2 Nondestructive Testing

Nondestructive testing must be in accordance with AWS D1.1 and AWS D1.8. Ultrasonic testing must be performed in accordance with Table 6.2 of AWS D1.1. Test locations must be selected by the Contracting Officer. All personnel performing NDT must be certified in accordance with ANSI/ASNT CP-189 in the method of testing being performed. Submit certificates showing compliance with ANSI/ASNT CP-189 for all NDT technicians. If more than 20 percent of welds made by a welder contain defects identified by testing, then all groove welds made by that welder must be tested by ultrasonic testing, and all fillet welds made by that welder must be inspected by magnetic particle testing (MT) or dye penetrant testing (PT) as approved by the Contracting Officer. When groove welds made by an individual welder are required to be tested, magnetic particle or dye penetrant testing may be used only in areas inaccessible to ultrasonic testing. Retest all repaired areas. Submit weld inspection reports.

Testing frequency: Provide the following types and number of tests:

<u>Test Type</u>	<u>Number of Tests</u>
Ultrasonic	50 percent of CJP Welds
Magnetic Particle	50 percent of PJP and Fillet Welds
Dye Penetrant	50 percent of PJP and Fillet Welds

3.7.2 Direct Tension Indicator Washers

3.7.2.1 Direct Tension Indicator Washer Compression

Test direct tension indicator washers in place to verify that they have been compressed sufficiently to provide the 0.015 inch gap, as required by ASTM F959. Submit direct tension indicator washer inspection reports.

3.7.3 High-Strength Bolts

3.7.3.1 Testing Bolt, Nut, and Washer Assemblies

Test a minimum of 3 bolt, nut, and washer assemblies from each mill

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certificate batch in a tension measuring device at the job site prior to the beginning of bolting start-up. Demonstrate that the bolts and nuts, when used together, can develop tension not less than the provisions specified in AISC 360, depending on bolt size and grade. The bolt tension must be developed by tightening the nut. A representative of the manufacturer or supplier must be present to ensure that the fasteners are properly used, and to demonstrate that the fastener assemblies supplied satisfy the specified requirements. Submit bolt testing reports.

3.7.3.2 Inspection

Inspection procedures must be in accordance with AISC 360. Confirm and report to the Contracting Officer that the materials meet the project specification and that they are properly stored. Confirm that the faying surfaces have been properly prepared before the connections are assembled. Observe the specified job site testing and calibration, and confirm that the procedure to be used provides the required tension. Monitor the work to ensure the testing procedures are routinely followed on joints that are specified to be fully tensioned.

3.7.3.3 Testing

The Government has the option to perform nondestructive tests on 5 percent of the installed bolts to verify compliance with pre-load bolt tension requirements. Provide the required access for the Government to perform the tests. The nondestructive testing will be done in-place using an ultrasonic measuring device or any other device capable of determining in-place pre-load bolt tension. The test locations must be selected by the Contracting Officer. If more than 10 percent of the bolts tested contain defects identified by testing, then all bolts used from the batch from which the tested bolts were taken, must be tested at the Contractor's expense. Retest new bolts after installation at the Contractor's expense.

3.7.4 Inspection and Testing of Steel Stud Welding

Perform verification inspection and testing of steel stud welding conforming to the requirements of AWS D1.1, Stud Welding Clause. The Contracting Officer will serve as the verification inspector. Bend test studs that do not show a full 360 degree weld flash or have been repaired by welding as required by AWS D1.1, Stud Welding Clause. Studs that crack under testing in the weld, base metal or shank will be rejected and replaced by the Contractor at no additional cost.

-- End of Section --

SECTION 05 30 00

STEEL DECKS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI D100 (2017) Cold-Formed Steel Design Manual

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1 (2020) Structural Welding Code - Steel

AWS D1.3 (2018) Structural Welding Code - Sheet Steel

ASTM INTERNATIONAL (ASTM)

ASTM A36 (2019) Standard Specification for Carbon Structural Steel

ASTM A123 (2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A780 (2020) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

ASTM A792 (2010; R 2015) Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process

ASTM A1008 (2020) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable

ASTM D746 (2014) Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact

ASTM D1056 (2014) Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber

ASTM D1149 (2007; R 2012) Standard Test Method for Rubber Deterioration - Surface Ozone Cracking in a Chamber

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ASTM E84	(2020) Standard Test Method for Surface Burning Characteristics of Building Materials
FM GLOBAL (FM)	
FM APP GUIDE	(updated on-line) Approval Guide http://www.approvalguide.com/
FM DS 1-28R	(1998) Data Sheet: Roof Systems
SOCIETY FOR PROTECTIVE COATINGS (SSPC)	
SSPC Paint 20	(2019) Zinc-Rich Primers (Type I, Inorganic, and Type II, Organic)
STEEL DECK INSTITUTE (SDI)	
ANSI/SDI C	(2017) Standard for Composite Steel Floor Deck - Slabs
ANSI/SDI NC	(2017) Standard for Non-Composite Steel Floor Deck
ANSI/SDI QA/QC	(2017) Standard for Quality Control and Quality Assurance for Installation of Steel Deck
ANSI/SDI RD	(2017) Standard for Steel Roof Deck
SDI DDM04	(2015; Errata 1-3 2016; Add 1 2015; Add 2 20162006) Diaphragm Design Manual; 4th Edition
SDI DDP	(1987; R 2000) Deck Damage and Penetrations
SDI MOC3	(2016) Manual of Construction with Steel Deck (3rd Edition)
U.S. DEPARTMENT OF DEFENSE (DOD)	
UFC 3-301-01	(2019) Structural Engineering
U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)	
29 CFR 1926	Safety and Health Regulations for Construction
UNDERWRITERS LABORATORIES (UL)	
UL 580	(2006; Reprint Mar 2019) UL Standard for Safety Tests for Uplift Resistance of Roof Assemblies
UL Fire Resistance	(2014) Fire Resistance Directory

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1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Deck Units

Galvanizing Repair Paint

Mechanical Fasteners

Touch-Up Paint

1.3 QUALITY ASSURANCE

1.3.1 Deck Units

Furnish deck units and accessory products from a manufacturer regularly engaged in manufacture of steel decking. Provide manufacturer's certificates attesting that the decking material meets the specified requirements.

1.3.2 Qualifications for Welding Work

Follow Welding Procedures of AWS D1.3 for sheet steel and AWS D1.1 for stud welding. Submit qualified Welder Qualifications in accordance with AWS D1.3 for sheet steel and AWS D1.1 for stud welding, or under an equivalent approved qualification test. Perform tests on test pieces in positions and with clearances equivalent to those actually encountered. If a test weld fails to meet requirements, perform an immediate retest of two test welds until each test weld passes. Failure in the immediate retest will require the welder be retested after further practice or training, performing a complete set of test welds.

Submit manufacturer's catalog data for Welding Equipment and Welding Rods and Accessories.

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1.3.3 Regulatory Requirements

1.3.3.1 Fire Safety

Test roof deck as a part of a roof deck construction assembly of the type used for this project, listing as fire classified in the UL Fire Resistance, or listing as Class I construction in the FM APP GUIDE, and so labeled.

1.3.3.2 Wind Storm Resistance

Provide roof construction assembly capable of withstanding a nominal uplift pressure as established in the Puerto Rico Building Code when tested in accordance with the uplift pressure test described in the FM DS 1-28R or as described in UL 580 and in general compliance with UFC 3-301-01.

1.3.4 Fabrication Drawings

Show type and location of units, location and sequence of connections, bearing on supports, methods of anchoring, attachment of accessories, adjusting plate details, cant strips, ridge and valley plates, metal closure strips, size and location of holes to be cut and reinforcement to be provided, the manufacturer's erection instructions and other pertinent details.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver deck units to the site in a dry and undamaged condition. Store and handle steel deck in a manner to protect it from corrosion, deformation, and other types of damage. Do not use decking for storage or as working platform until units have been fastened into position. Exercise care not to damage material or overload decking during construction. The maximum uniform distributed storage load must not exceed the design live load. Stack decking on platforms or pallets and cover with weathertight ventilated covering. Elevate one end during storage to provide drainage. Maintain deck finish at all times to prevent formation of rust. Repair deck finish using touch-up paint. Replace damaged material.

1.5 DESIGN REQUIREMENTS FOR ROOF DECKS

1.5.1 Properties of Sections

Properties of metal roof deck sections must comply with engineering design width as limited by the provisions of AISI D100.

1.5.2 Allowable Loads

Indicate total uniform dead and live load for detailing purposes.

PART 2 PRODUCTS

2.1 DECK UNITS

Submit manufacturer's design calculations, or applicable published literature for the structural properties of the proposed deck units.

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2.1.1 Roof Deck

Conform to ASTM A792 or ASTM A1008 for deck used in conjunction with insulation and built-up roofing. Fabricate roof deck units of the steel design thickness required by the design drawings and shop painted. Furnish sample of Metal Roof Deck Units used to illustrate actual cross section dimensions and configurations.

2.1.2 Length of Deck Units

Provide deck units of sufficient length to span three or more spacings where possible.

2.1.3 Shop Priming

Shop prime accessories and underside of deck at the factory after coating. Clean surfaces in accordance with the manufacturer's standard procedure followed by a spray, dip or roller coat of rust-inhibitive primer, oven cured.

2.1.4 Touch-Up Paint

Provide a high zinc-dust content paint for regalvanizing welds in galvanized steel conforming to ASTM A780.

Provide touch-up paint for shop-painted units of the same type used for the shop painting, and touch-up paint for zinc-coated units of an approved galvanizing repair paint with a high-zinc dust content. Touch-up welds with paint conforming to SSPC Paint 20 in accordance with ASTM A780. Maintain finish of deck units and accessories by using touch-up paint whenever necessary to prevent the formation of rust.

2.2 ACCESSORIES

Provide accessories of same material as deck, unless specified otherwise. Provide manufacturer's standard type accessories, as specified.

2.2.1 Adjusting Plates

Provide adjusting plates, or segments of deck units, of same thickness and configuration as deck units in locations too narrow to accommodate full size units. Provide factory cut plates of predetermined size where possible.

2.2.2 End Closures

Fabricated of sheet metal by the deck manufacturer. Provide end closures minimum 0.0295 inch thick to close open ends at parapets, openings through deck.

2.2.3 Partition Closures

Provide closures for closing voids above interior walls and partitions that are perpendicular to the direction of the configurations.

2.2.4 Flexible Closure Strips for Roof Decks

Provide strips made of vulcanized, closed-cell, synthetic rubber material specified and premolded to the configuration required to provide

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tight-fitting closures at open ends and sides of steel roof decking.

Conforming to ASTM D1056, Grade 2A1, with the following additional properties:

Brittleness temperature of minus 40 degrees F when tested in accordance with ASTM D746.

Flammability resistance with a flame spread rating of less than 25 when tested in accordance with ASTM E84.

Resistance to ozone must be "no cracks" after exposure of a sample kept under a surface tensile strain of 25 percent to an ozone concentration of 100 parts per million of air by volume in air for 100 hours at 104 degrees F and tested in accordance with ASTM D1149.

Provide a elastomeric type adhesive as recommended by the manufacturer of the flexible closure strips.

2.2.5 Closure Plates for Composite Deck

Support and retain concrete at each floor level. Provide edge closures at all edges of the slab of sufficient strength and stiffness to support the wet concrete. Provide metal closures for all openings in composite steel deck 1/4 inch and over.

2.2.6 Sheet Metal Collar

Where deck is cut for passage of pipes, ducts, columns, etc., and deck is to remain exposed, provide a neatly cut sheet metal collar to cover edges of deck. Do not cut deck until after installation of supplemental supports.

2.2.7 Cover Plates

Sheet metal to close panel edge and end conditions, and where panels change direction or butt. Polyethylene-coated, self-adhesive, 2 inch wide joint tape may be provided in lieu of cover plates on flat-surfaced decking butt joints.

Fabricate cover plates for abutting floor deck units from the specified structural-quality steel sheets not less than nominal 18 gage thick before galvanizing. Provide 6 inch wide cover plates and form to match the contour of the floor deck units.

2.2.8 Roof Sump Pans

Sump pans must be provided for roof drains and must be minimum 0.075 inch thick steel, flat type. Shape sump pans to meet roof slope by the supplier or by a sheet metal specialist. Provide bearing flanges of sump pans to overlap steel deck a minimum of 3 inch. Shape, size, and reinforce the opening in bottom of the sump pan to receive roof drain.

2.2.9 Column Closures

Sheet metal, minimum 0.0358 inch thick or metal rib lath.

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2.2.10 Access Hole Covers

Sheet metal, minimum 0.0474 inch thick.

2.2.11 Hanger

Provide clips or loops for utility systems of one or more of the following types:

- a. Lip tabs or integral tabs where noncellular decking or flat plate of cellular section is 0.0474 inch thick or more, and a structural concrete fill is used over deck.
- b. Slots or holes punched in decking for installation of pigtails.
- c. Tabs driven from top side of decking and arranged so as not to pierce electrical cells.
- d. Decking manufacturer's standard as approved by the Contracting Officer.

2.2.12 Shear Connectors

Provide shear connectors in accordance with AWS D1.1 headed stud Type B. Submit stud manufacture's certification that the studs delivered conform to the material requirements. Submit stud manufacture's test reports for the last completed in-plant quality control mechanical tests.

2.2.13 Cant Strips for Roof Decks

Fabricate cant strips from the specified commercial-quality steel sheets not less than nominal 0.0358 inch thick before galvanizing. Bend strips to form a 45-degree cant not less than 5 inch wide, with top and bottom flanges a minimum 3 inch wide. Length of strips 10 feet.

2.2.14 Ridge and Valley Plates for Roof Decks

Fabricate plates from the specified structural-quality steel sheets, not less than nominal 0.0358 inch thick before galvanizing. Provide plates of minimum 4-1/2 inch wide and bent to provide tight fitting closures at ridges and valleys. Provide a minimum length of ridge and valley plates of 10 feet.

2.2.15 Metal Closure Strips for Roof Decks

Fabricate strips from the specified commercial-quality steel sheets not less than nominal 0.0358 inch thick before galvanizing. Provide strips from the configuration required to provide tight-fitting closures at open ends and sides of steel roof decking.

2.2.16 Galvanized Steel Angles for Roof Decks

Provide hot-rolled carbon steel angles conforming to ASTM A36, and hot-dip galvanized in accordance with ASTM A123.

2.2.17 Miscellaneous Accessories

Furnish the manufacturer's standard accessories to complete the deck installation. Furnish metal accessories of the same material as the deck and with the minimum design thickness as follows: saddles, 0.0474 inch welding washers, 0.0598 inch other metal accessories, 0.0358 inch unless

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otherwise indicated.

PART 3 EXECUTION

3.1 EXAMINATION

Prior to installation of decking units and accessories, examine worksite to verify that as-built structure will permit installation of decking system without modification.

3.2 INSTALLATION

Install steel deck units in accordance with 29 CFR 1926, Subpart R - Steel Erection, ANSI/SDI QA/QC, ANSI/SDI C and approved shop drawings. Place units on structural supports, properly adjusted, leveled, and aligned at right angles to supports before permanently securing in place. Damaged deck and accessories including material which is permanently stained or contaminated, deformed, or with burned holes shall not be installed. Extend deck units over three or more supports unless absolutely impractical. Report inaccuracies in alignment or leveling to the Contracting Officer and make necessary corrections before permanently anchoring deck units. Locate deck ends over supports only. Lap 2 inch deck ends. Do not use unanchored deck units as a work or storage platform. Do not fill unanchored deck with concrete. Permanently anchor units placed by the end of each working day. Do not support suspended ceilings, light fixtures, ducts, utilities, or other loads by steel deck unless indicated. Distribute loads by appropriate means to prevent damage.

3.2.1 Attachment

Immediately after placement and alignment, and after correcting inaccuracies, permanently fasten steel deck units to structural supports and to adjacent deck units by welding with normal 5/8 inch diameter puddle welds, fastened with screws, powder-actuated fasteners, or pneumatically driven fasteners as indicated on the design drawings and in accordance with manufacturer's recommended procedure and ANSI/SDI C, ANSI/SDI NC or ANSI/SDI RD. Clamp or weight deck units to provide firm contact between deck units and structural supports while performing welding or fastening. Anchoring the deck to structural supports with powder-actuated fasteners or pneumatically driven fasteners is prohibited. Attachment of adjacent deck units by button-punching is prohibited.

3.2.1.1 Welding

Perform welding in accordance with AWS D1.3 using methods and electrodes recommended by the manufacturers of the base metal alloys being used. Ensure only operators previously qualified by tests prescribed in AWS D1.3 make welds. Immediately recertify, or replace qualified welders, that are producing unsatisfactory welding. Conform to the recommendations of the Steel Deck Institute and the steel deck manufacturer for location, size, and spacing of fastening. Do not use welding washers at the connections of the deck to supports. Do not use welding washers at sidelaps. Holes and similar defects will not be acceptable. Attach all partial or segments of deck units to structural supports in accordance with Section 2.5 of SDI DDM04. Attach shear connectors as shown and welded as per AWS D1.1 directly to the steel member. Immediately clean welds by chipping and wire brushing. Heavily coat welds, cut edges and damaged portions of shop primed finish with the manufacturer's standard touch-up paint.

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3.2.1.2 Mechanical Fastening

Anchor deck to structural supports and adjoining units with mechanical fasteners. Drive pneumatically fasteners with a low-velocity fastening tool and comply with the manufacturer's recommendations.

3.2.1.3 Sidelap Fastening

Lock sidelaps between adjacent floor deck units together by welding or screws as indicated.

3.2.2 Openings

Cut or drill all holes and openings required and be coordinated with the drawings, specifications, and other trades. Frame and reinforce openings through the deck in conformance with SDI DDP. Reinforce holes and openings

6 to 12 inch across by 0.0474 inch thick steel sheet at least 12 inch wider and longer than the opening and be fastened to the steel deck at each corner of the sheet and at a maximum of 6 inch on center. Reinforce holes and openings larger than 12 inch by steel channels or angles installed perpendicular to the steel joists and supported by the adjacent steel joists. Install steel channels or angles perpendicular to the deck ribs and fasten to the channels or angles perpendicular to the steel joists.

3.2.3 Deck Damage

SDI MOC3, for repair of deck damage.

3.2.4 Touch-Up Paint

3.2.4.1 Roof Deck

After roof decking installation, wire brush, clean, and touchup paint the scarred areas on top and bottom surfaces of metal roof decking. The scarred areas include welds, weld scars, bruises, and rust spots. Touchup galvanized surfaces with galvanizing repair paint. Touchup painted surfaces with repair paint of painted surfaces.

3.2.4.2 Floor Deck

For floor decking installation, wire brush, clean, and touchup paint the scarred areas on the top and bottom surfaces of the metal floor decking and on the surface of supporting steel members. Include welds, weld scars, bruises, and rust spots for scarred areas. Touched up the galvanized surfaces with galvanizing repair paint. Touch up the painted surfaces with paint for the repair of painted surfaces.

3.2.5 Accessory Installation

3.2.5.1 Adjusting Plates

Provide in locations too narrow to accommodate full-size deck units and install as shown on shop drawings.

3.2.5.2 End Closures

Provide end closure to close open ends of cells at columns, walls, and

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openings in deck.

3.2.5.3 Closures Above Partitions

Provide for closing voids between cells over partitions that are perpendicular to direction of cells. Provide a one-piece closure strip for partitions 4 inch nominal or less in thickness and two-piece closure strips for wider partitions.

3.2.5.4 Cover Plates

Provide metal cover plates, or joint tape, at joints between cellular decking sheets to be used as electrical raceways.

3.2.5.5 Column Closures

Provide for spaces between floor decking and columns which penetrate the deck. Field cut closure plate to fit column in the field and tack weld to decking and columns.

3.2.5.6 Access Hole Covers

Provide access whole covers to seal holes cut in decking to facilitate welding of the deck to structural supports.

3.2.5.7 Hangers

Provide as indicated to support utility system . Space devices as indicated .

3.2.6 Preparation of Fire-Proofed Surfaces

Provide deck surfaces, both composite and noncomposite, which are to receive sprayed-on fireproofing, galvanized and free of all grease, mill oil, paraffin, dirt, salt, and other contaminants which impair adhesion of the fireproofing. Complete any required cleaning prior to steel deck installation using a cleaning method that is compatible with the sprayed-on fireproofing.

3.3 ROOF SUMP PANS

Place sump pans over openings in roof decking and fusion welded to top surface of roof decking. Do not exceed spacing of welds of 12 inch with not less than one weld at each corner. Field cut opening in the bottom of each roof sump pan to receive the roof drain as part of the work of this section.

3.4 CANT STRIPS FOR ROOF DECKS

Provide strips to be fusion welded to surface of roof decking, secured to wood nailers by galvanized screws or to steel framing by galvanized self-tapping screws or welds. Do not exceed spacing of welds and fasteners of 12 inch. Lap end joints a minimum 3 inch and secure with galvanized sheet metal screws spaced a maximum 4 inch on center.

3.5 RIDGE AND VALLEY PLATES FOR ROOF DECKS

Provide plates to be fusion welded to top surface of roof decking. Lap end joints a minimum 3 inch. For valley plates, provide endlaps to be in

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the direction of water flow.

3.6 CLOSURE STRIPS FOR ROOF DECKS

Provide closure strips at open, uncovered ends and edges of the roof decking and in voids between roof decking and top of walls and partitions where indicated. Install closure strips in position in a manner to provide a weathertight installation.

3.7 ROOF INSULATION SUPPORT FOR ROOF DECKS

Provide metal closure strips for support of roof insulation where rib openings in top surface of metal roof decking occur adjacent to edges and openings. Weld metal closure strips in position.

3.8 CLEANING AND PROTECTION FOR ROOF DECKS

Upon completion of the deck, sweep surfaces clean and prepare for installation of the roofing.

3.9 FIELD QUALITY CONTROL

3.9.1 Headed Stud Inspection

In addition to visual inspection, test and inspect shop-welded shear connectors according to requirements in AWS D1.1 for stud welding and as follows:

- a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
- b. Conduct tests according to requirements in AWS D1.1 on additional shear connectors if weld fracture occurs on shear connectors already tested.

3.9.2 Deck Weld Inspection

Visual inspect welds in accordance with AWS D1.3.

3.9.3 Decks Not Receiving Concrete

Inspect the decking top surface for distortion after installation. For roof decks not receiving concrete, verify distortion by placing a straight edge across three adjacent top flanges. The maximum allowable gap between the straight edge and the top flanges should not exceed manufacturing and construction tolerances of supporting members. When gap is more than the allowable, provide corrective measures or replacement. Reinspect decking after performing corrective measures or replacement.

-- End of Section --

SECTION 05 50 13

MISCELLANEOUS METAL FABRICATIONS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ALUMINUM ASSOCIATION (AA)

AA DAF45 (2003; Reaffirmed 2009) Designation System
for Aluminum Finishes

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 303 (2016) Code of Standard Practice for Steel
Buildings and Bridges

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B18.2.1 (2012; Errata 2013) Square and Hex Bolts
and Screws (Inch Series)

ASME B18.2.2 (2015) Nuts for General Applications:
Machine Screw Nuts, Hex, Square, Hex
Flange, and Coupling Nuts (Inch Series)

ASME B18.6.2 (1998; R 2010) Slotted Head Cap Screws,
Square Head Set Screws, and Slotted
Headless Set Screws: Inch Series

ASME B18.6.3 (2013; R 2017) Machine Screws, Tapping
Screws, and Machine Drive Screws (Inch
Series)

ASME B18.21.1 (2009; R 2016) Washers: Helical
Spring-Lock, Tooth Lock, and Plain Washers
(Inch Series)

ASME B18.21.2M (1999; R 2014) Lock Washers (Metric Series)

ASME B18.22M (1981; R 2017) Metric Plain Washers

AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)

ASSP A10.3 (2013) Safety Requirements for
Powder-Actuated Fastening Systems American
National Standard for Construction and
Demolition Operations

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2020) Structural Welding Code - Steel

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ASTM INTERNATIONAL (ASTM)

ASTM A48/A48M	(2003; R 2016) Standard Specification for Gray Iron Castings
ASTM A108	(2013) Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished
ASTM A307	(2014; E 2017) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
ASTM B26/B26M	(2014; E 2015) Standard Specification for Aluminum-Alloy Sand Castings
ASTM B108/B108M	(2019) Standard Specification for Aluminum-Alloy Permanent Mold Castings
ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B209M	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric)
ASTM B221	(2014) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B221M	(2013) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric)
ASTM C1513	(2018) Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections
ASTM D1187/D1187M	(1997; E 2011; R 2011) Asphalt-Base Emulsions for Use as Protective Coatings for Metal
ASTM E488/E488M	(2015) Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements
ASTM F1554	(2018) Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength

MASTER PAINTERS INSTITUTE (MPI)

MPI 79	(2016) Primer, Alkyd, Anti-Corrosive for Metal
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NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM MBG 531	(2017) Metal Bar Grating Manual
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SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC SP 3 (2018) Power Tool Cleaning

SSPC SP 6/NACE No.3 (2007) Commercial Blast Cleaning

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (2014) Safety and Health Requirements Manual

1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Embedded Angles and Plates, Installation Drawings; G

SD-03 Product Data

Downspout Terminations Type; G

1.3 QUALIFICATION OF WELDERS

Qualify welders in accordance with AWS D1.1/D1.1M. Use procedures, materials, and equipment of the type required for the work.

1.4 DELIVERY, STORAGE, AND PROTECTION

Protect from corrosion, deformation, and other types of damage. Store items in an enclosed area free from contact with soil and weather. Remove and replace damaged items with new items.

1.5 MISCELLANEOUS REQUIREMENTS

1.5.1 Fabrication Drawings

Submit fabrication drawings showing layout(s), connections to structural system, and anchoring details as specified in AISC 303.

1.5.2 Installation Drawings

Submit templates, erection, and installation drawings indicating thickness, type, grade, class of metal, and dimensions. Show construction details, reinforcement, anchorage, and installation in relation to the building construction.

PART 2 PRODUCTS

2.1 MATERIALS

Provide exposed fastenings of compatible materials (avoid contact of dissimilar metals). Coordinate color and finish with the material to

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which fastenings are applied. Submit the manufacturer's certified mill reports which clearly show the applicable ASTM mechanical and chemical requirements together with the actual test results for the supplied materials.

2.1.1 Gratings

- a. Provide gray cast iron in accordance with ASTM A48/A48M, Class 40.
- b. Provide metal plank grating, non-slip requirement, aluminum in accordance with ASTM B209M ASTM B209, 6061-T6.
- c. Provide metal bar type grating in accordance with NAAMM MBG 531.

2.1.2 Anchor Bolts

Provide in accordance with ASTM F1554. Where exposed, provide anchor bolts of the same material, color, and finish as the metal to which they are applied.

2.1.2.1 Expansion Anchors

Provide 1/2in. diameter expansion anchors. Minimum concrete embedment of 8in. Design values listed are as tested in accordance with ASTM E488/E488M.

2.1.2.2 Lag Screws and Bolts

Provide in accordance with ASME B18.2.1, type and grade best suited for the purpose.

2.1.2.3 Toggle Bolts

Provide in accordance with ASME B18.2.1.

2.1.2.4 Bolts, Nuts, Studs and Rivets

Provide in accordance with ASME B18.2.2 or ASTM A307.

2.1.2.5 Powder Actuated Fasteners

Follow safety provisions in accordance with ASSP A10.3.

2.1.2.6 Screws

Provide in accordance with ASME B18.2.1, ASME B18.6.2, ASME B18.6.3 and ASTM C1513.

2.1.2.7 Washers

Provide plain washers in accordance with ASME B18.22M, ASME B18.21.1. Provide beveled washers for American Standard beams and channels, square or rectangular, tapered in thickness, and smooth. Provide lock washers in accordance with ASME B18.21.2M, ASME B18.21.1.

2.1.2.8 Welded Headed Shear Studs

Provide in accordance with ASTM A108.

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2.1.3 Aluminum Alloy Products

Provide in accordance with ASTM B209M, ASTM B209 for sheet plate, ASTM B221M, ASTM B221M, ASTM B221 for extrusions and ASTM B26/B26M or ASTM B108/B108M for castings. Provide aluminum extrusions at least 1/8 inch thick and aluminum plate or sheet at least 0.050 inch thick.

2.2 FABRICATION FINISHES

2.2.1 Shop Cleaning and Painting

2.2.1.1 Surface Preparation

Blast clean surfaces in accordance with SSPC SP 6/NACE No.3. Surfaces that will be exposed in spaces above ceiling or in attic spaces, crawl spaces, furred spaces, and chases may be cleaned in accordance with SSPC SP 3 in lieu of being blast cleaned. Wash cleaned surfaces which become contaminated with rust, dirt, oil, grease, or other contaminants with solvents until thoroughly clean. Steel to be embedded in concrete must be free of dirt and grease prior to embed. Do not paint or galvanize bearing surfaces, including contact surfaces within slip critical joints. Shop coat these surfaces with rust prevention.

2.2.1.2 Pretreatment, Priming and Painting

Apply pre-treatment, primer, and paint in accordance with manufacturer's printed instructions.

2.2.2 Aluminum Surfaces

2.2.2.1 Surface Condition

Before finishes are applied, remove roll marks, scratches, rolled-in scratches, kinks, stains, pits, orange peel, die marks, structural streaks, and other defects which will affect uniform appearance of finished surfaces.

2.2.2.2 Aluminum Finishes

Unexposed sheet, plate and extrusions may have mill finish as fabricated. Sandblast castings' finish, medium, AA DAF45. Unless otherwise specified, provide all other aluminum items with a standard mill finish. Provide a coating thickness not less than that specified for protective and decorative type finishes for items used in interior locations or architectural Class I type finish for items used in exterior locations. Provide in accordance with AA DAF45. Provide a polished satin finish on items to be anodized.

2.3 DOWNSPOUT TERMINATIONS

Provide 4x4 inch, aluminum downspout tile adapter with mill finish. Units shall have all seams welded.

Provide nickel bronze cast downspout nozzle and flange.

[]PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

Install items at locations indicated in accordance with manufacturer's instructions. Verify all field dimensions prior to fabrication. Include materials and parts necessary to complete each assembly, whether indicated or not. Miss-alignment and miss-sizing of holes for fasteners is cause for rejection. Conceal fastenings where practicable. Joints exposed to weather must be watertight.

3.2 WORKMANSHIP

Provide miscellaneous metalwork that is true and accurate in shape, size, and profile. Make angles and lines continuous and straight. Make curves consistent, smooth and unfaceted. Provide continuous welding along the entire area of contact except where tack welding is permitted. Do not tack weld exposed connections. Unless otherwise indicated and approved, provide a smooth finish on exposed surfaces. Provide countersunk rivets where exposed. Provide coped and mitered corner joints aligned flush and without gaps.

3.3 ANCHORAGE, FASTENINGS, AND CONNECTIONS

Provide anchorage as necessary, whether indicated or not, for fastening miscellaneous metal items securely in place. Include slotted inserts, expansion shields, powder-driven fasteners, toggle bolts (when approved for concrete), through bolts for masonry, headed shear studs, machine and carriage bolts for steel, through bolts, lag bolts, and screws for wood. Do not use wood plugs. Provide non-ferrous attachments for non-ferrous metal. Provide exposed fastenings of compatible materials (avoid contact of dissimilar metals), that generally match in color and finish the surfaces to which they are applied. Conceal fastenings where practicable. Provide all fasteners flush with the surfaces they fasten, unless indicated otherwise. [Test a minimum of 2 bolt, nut, and washer assemblies from each certified mill batch in a tension measuring device at the job site prior to the beginning of bolting start-up.]

3.4 BUILT-IN WORK

Where necessary and not otherwise indicated, form built-in metal work for anchorage with concrete or masonry. Provide built-in metal work in ample time for securing in place as the work progresses.

3.5 WELDING

Perform welding, welding inspection, and corrective welding in accordance with AWS D1.1/D1.1M. Use continuous welds on all exposed connections. Grind visible welds smooth in the finished installation. Provide welded headed shear studs in accordance with AWS D1.1/D1.1M, Clause 7, except as otherwise specified. Provide in accordance with the safety requirements of EM 385-1-1.

3.6 DISSIMILAR METALS

Where dissimilar metals are in contact, protect surfaces with a coating in accordance with MPI 79 to prevent galvanic or corrosive action. Where aluminum is in contact with concrete, plaster, mortar, masonry, wood, or absorptive materials subject to wetting, protect in accordance with

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ASTM D1187/D1187M, asphalt-base emulsion. Clean surfaces with metal shavings from installation at the end of each work day.

3.7 PREPARATION

3.7.1 Material Coatings and Surfaces

Remove rust preventive coating just prior to field erection, using a remover approved by the metal manufacturer. Surfaces, when assembled, must be free of rust, grease, dirt and other foreign matter.

[]3.8 INSTALLATION OF DOWNSPOUT TERMINATIONS

Secure downspouts terminations to downspouts and substrate per manufacturer's instructions.

-- End of Section --

SECTION 09 90 00

PAINTS AND COATINGS

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

1.1.1 Painting Included

Where a space or surface is indicated to be painted, include the following unless indicated otherwise.

- a. Surfaces behind portable objects and surface mounted articles readily detachable by removal of fasteners, such as screws and bolts.
- b. New factory finished surfaces that require identification or color coding and factory finished surfaces that are damaged during performance of the work.
- c. Existing coated surfaces that are damaged during performance of the work.

1.1.2 Painting Excluded

Do not paint the following unless indicated otherwise.

- a. Surfaces concealed and made inaccessible by panelboards, fixed ductwork, machinery, and equipment fixed in place.
- b. Surfaces in concealed spaces. Concealed spaces are defined as enclosed spaces above suspended ceilings, furred spaces, attic spaces, crawl spaces, elevator shafts and chases.
- c. Steel to be embedded in concrete.
- d. Copper, stainless steel, aluminum, anodized aluminum, brass, and lead except existing coated surfaces.
- e. Hardware, fittings, and other factory finished items.

1.1.3 Mechanical and Electrical Painting

Includes field coating of interior and exterior new and existing surfaces.

- a. Where a space or surface is indicated to be painted, include the following items unless indicated otherwise.
 - (1) Exposed piping, conduit, and ductwork;
 - (2) Supports, hangers, air grilles, and registers;
 - (3) Miscellaneous metalwork and insulation coverings.

1.2 REFERENCES

The publications listed below form a part of this specification to the

Technical Specifications

extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

ACGIH 0100 (2017; Suppl 2020) Documentation of the Threshold Limit Values and Biological Exposure Indices

ASTM INTERNATIONAL (ASTM)

ASTM D235 (2002; R 2012) Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry Cleaning Solvent)

ASTM D523 (2014; R 2018) Standard Test Method for Specular Gloss

ASTM D4214 (2007; R 2015) Standard Test Method for Evaluating the Degree of Chalking of Exterior Paint Films

ASTM D4263 (1983; R 2018) Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method

ASTM D4444 (2013; R 2018) Standard Test Method for Laboratory Standardization and Calibration of Hand-Held Moisture Meters

ASTM D6386 (2016a) Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting

ASTM F1869 (2016a) Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

CENTERS FOR DISEASE CONTROL AND PREVENTION (CDC)

Intelligence Bulletin 65 (2013) Occupational Exposure to Carbon Nanotubes and Nanofibers

MASTER PAINTERS INSTITUTE (MPI)

MPI 101 (2016) Primer, Epoxy, Anti-Corrosive, for Metal

MPI 107 (2016) Primer, Rust-Inhibitive, Water Based

MPI ASM (2019) Architectural Painting Specification Manual

MPI GPS-1-14 (2014) Green Performance Standard GPS-1-14

MPI GPS-2-14 (2014) Green Performance Standard GPS-2-14

MPI MRM (2015) Maintenance Repainting Manual

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SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC 7/NACE No.4	(2007) Brush-Off Blast Cleaning
SSPC Glossary	(2011) SSPC Protective Coatings Glossary
SSPC PA 1	(2016) Shop, Field, and Maintenance Coating of Metals
SSPC SP 1	(2015) Solvent Cleaning
SSPC SP 2	(2018) Hand Tool Cleaning
SSPC SP 3	(2018) Power Tool Cleaning
SSPC SP 6/NACE No.3	(2007) Commercial Blast Cleaning
SSPC SP 10/NACE No. 2	(2007) Near-White Blast Cleaning
SSPC VIS 1	(2002; E 2004) Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning
SSPC VIS 3	(2004) Guide and Reference Photographs for Steel Surfaces Prepared by Hand and Power Tool Cleaning
SSPC VIS 4/NACE VIS 7	(1998; E 2000; E 2004) Guide and Reference Photographs for Steel Surfaces Prepared by Waterjetting
SSPC-SP WJ-1/NACE WJ-1	(2012) Clean to Bare Substrate, Waterjet Cleaning of Metals
SSPC-SP WJ-2/NACE WJ-2	(2012) Very Thorough Cleaning, Waterjet Cleaning of Metals
SSPC-SP WJ-3/NACE WJ-3	(2012) Thorough Cleaning, Waterjet Cleaning of Metals
SSPC-SP WJ-4/NACE WJ-4	(2012) Light Cleaning, Waterjet Cleaning of Metals

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2014) Safety and Health Requirements Manual
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U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FED-STD-313	(2018) Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Government Activities
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U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.1000	Air Contaminants
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1.3 DEFINITIONS

1.3.1 Qualification Testing

Qualification testing is the performance of all test requirements listed in the product specification. This testing is accomplished by MPI to qualify each product for the MPI Approved Product List, and may also be accomplished by Contractor's third-party testing lab if an alternative to Batch Quality Conformance Testing by MPI is desired.

1.3.2 Batch Quality Conformance Testing

Batch quality conformance testing determines that the product provided is the same as the product qualified to the appropriate product specification. This testing must be accomplished by an MPI testing lab.

1.3.3 Coating

SSPC Glossary; (1) A liquid, liquefiable, or mastic composition that is converted to a solid protective, decorative, or functional adherent film after application as a thin layer; (2) Generic term for paint, lacquer, enamel.

1.3.4 DFT or dft

Dry film thickness, the film thickness of the fully cured, dry paint or coating.

1.3.5 DSD

Degree of Surface Degradation, the MPI system of defining degree of surface degradation. Five levels are generically defined under the Assessment sections in the MPI MRM, MPI Maintenance Repainting Manual.

1.3.6 Loose Paint

Paint or coating that can be removed with a dull putty knife.

1.3.7 mil / mils

The English measurement for 0.001 in or one one-thousandth of an inch.

1.3.8 MPI Gloss Levels

MPI system of defining gloss. Seven gloss levels (G1 to G7) are generically defined under the Evaluation sections of the MPI Manuals. Traditionally, Flat refers to G1/G2, Eggshell refers to G3, Semigloss refers to G5, and Gloss refers to G6.

Gloss levels are defined by MPI as follows:

Gloss Level	Description	Units at 60 degree angle	Units at 80 degree angle
G1	Matte or Flat	0 to 5	10 max
G2	Velvet	0 to 10	10 to 35

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Gloss Level	Description	Units at 60 degree angle	Units at 80 degree angle
G3	Eggshell	10 to 25	10 to 35
G4	Satin	20 to 35	35 min
G5	Semi-Gloss	35 to 70	
G6	Gloss	70 to 85	
G7	High Gloss		

Gloss is tested in accordance with ASTM D523. Historically, the Government has used Flat (G1 / G2), Eggshell (G3), Semi-Gloss (G5), and Gloss (G6).

1.3.9 MPI System Number

The MPI coating system number in each MPI Division found in either the MPI Architectural Painting Specification Manual or the Maintenance Repainting Manual and defined as an exterior (EXT/REX) or interior system (INT/RIN).

1.3.10 Paint

SSPC Glossary; (1) Any pigmented liquid, liquefiable, or mastic composition designed for application to a substrate in a thin layer that is converted to an opaque solid film after application. Used for protection, decoration, identification, or to serve some other functional purposes; (2) Application of a coating material.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

Samples of specified materials may be taken and tested for compliance with specification requirements.

SD-02 Shop Drawings

Piping Identification

SD-03 Product Data

Coating; G

Product Data Sheets

SD-04 Samples

Color; G

SD-07 Certificates

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Qualification Testing laboratory for coatings; G

1.5 QUALITY ASSURANCE

1.5.1 Regulatory Requirements

1.5.1.1 Environmental Protection

In addition to requirements specified elsewhere for environmental protection, provide coating materials that conform to the restrictions of the local Air Pollution Control District and regional jurisdiction. Notify Contracting Officer of any paint specified herein which fails to conform.

1.5.1.2 Lead Content

Do not use coatings having a lead content.

1.5.1.3 Chromate Content

Do not use coatings containing zinc-chromate or strontium-chromate.

1.5.1.4 Asbestos Content

Provide asbestos-free materials.

1.5.1.5 Mercury Content

Provide materials free of mercury or mercury compounds.

1.5.1.6 Silica

Provide abrasive blast media containing no free crystalline silica.

1.5.1.7 Human Carcinogens

Provide materials that do not contain ACGIH 0100 confirmed human carcinogens (A1) or suspected human carcinogens (A2).

1.5.1.8 Carbon Based Fibers / Tubes

Materials must not contain carbon based fibers such as carbon nanotubes or carbon nanofibers. Intelligence Bulletin 65 ranks toxicity of carbon nanotubes on a par with asbestos.

1.5.2 Approved Products List

The current MPI, "Approved Product List" which lists paint by brand, label, product name and product code as of the date of Contract award, will be used to determine compliance with the submittal requirements of this specification. The Contractor may choose to use a subsequent MPI "Approved Product List", however, only one list may be used for the entire Contract and each coating system is to be from a single manufacturer.

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Provide all coats on a particular substrate from a single manufacturer. No variation from the MPI Approved Products List is acceptable.

1.5.3 Paints and Coatings Indoor Air Quality Certifications

Provide paint and coating products certified to meet indoor air quality requirements by MPI GPS-1-14, MPI GPS-2-14 or provide certification by other third-party programs. Provide current product certification documentation from certification body.

Provide certification of Indoor Air Quality for Paints and Primers.
Provide certification of Indoor Air Quality for Consolidated Latex Paints.
Submit required indoor air quality certifications in one submittal package.

1.5.4 Field Samples and Tests

The Contracting Officer may choose up to two coatings that have been delivered to the site to be tested at no cost to the Government. Take samples of each chosen product as specified in the paragraph SAMPLING PROCEDURE. Test each chosen product as specified in the paragraph TESTING PROCEDURE. Remove products from the job site which do not conform, and replace with new products that conform to the referenced specification. Test replacement products that failed initial testing as specified in the paragraph TESTING PROCEDURE at no cost to the Government.

1.5.4.1 Sampling Procedure

Select paint at random from the products that have been delivered to the job site for sample testing. The Contractor must provide one quart samples of the selected paint materials. Take samples in the presence of the Contracting Officer, and label, and identify each sample. Provide labels in accordance with the paragraph PACKAGING, LABELING, AND STORAGE.

1.5.4.2 Testing Procedure

Provide Batch Quality Conformance Testing for specified products, as defined by and performed by MPI. As an alternative to Batch Quality Conformance Testing, the Contractor may provide Qualification Testing for specified products above to the appropriate MPI product specification, using the third-party laboratory approved under the paragraph QUALIFICATION TESTING laboratory for coatings. Include the backup data and summary of the test results within the qualification testing lab report. Provide a summary listing of all the reference specification requirements and the result of each test. Clearly indicate in the summary whether the tested paint meets each test requirement. Note that Qualification Testing may take 4 to 6 weeks to perform, due to the extent of testing required.

Submit name, address, telephone number, FAX number, and e-mail address of the independent third party laboratory selected to perform testing of coating samples for compliance with specification requirements. Submit documentation that laboratory is regularly engaged in testing of paint samples for conformance with specifications, and that employees performing testing are qualified. If MPI is chosen to perform the Batch Quality Conformance testing, the above submittal information is not required, only a letter is required from the Contractor stating that MPI will perform the testing.

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1.5.5 Textured Wall Coating System

Three complete samples of each indicated type, pattern, and color of textured wall coating system applied to a panel of the same material as that on which the coating system will be applied in the work. Provide samples of wall coating systems minimum 5 by 7 inches and of sufficient size to show pattern repeat and texture.

1.5.6 Sample Textured Wall Coating System Mock-Up

After coating samples are approved and prior to starting installation, provide a minimum 8 foot by 8 foot mock-up for each substrate and for each color and type of textured wall coating using the actual substrate materials. Use the approved mock-up samples as a standard of workmanship for installation within the facility. Submit at least 48 hour advance written notice to the Contracting Officer's Representative prior to mock-up installation.

1.6 PACKAGING, LABELING, AND STORAGE

Provide paints in sealed containers that legibly show the Contract specification number, designation name, formula or specification number, batch number, color, quantity, date of manufacture, manufacturer's formulation number, manufacturer's directions including any warnings and special precautions, and name and address of manufacturer. Furnish pigmented paints in containers not larger than 5 gallons. Store paints and thinners in accordance with the manufacturer's written directions, and as a minimum, stored off the ground, under cover, with sufficient ventilation to prevent the buildup of flammable vapors, and at temperatures between 40 to 95 degrees F.

1.7 SAFETY AND HEALTH

Comply with applicable Federal, State, and local laws and regulations, and with the ACCIDENT PREVENTION PLAN, including the Activity Hazard Analysis as specified Appendix A of EM 385-1-1. Include in the Activity Hazard Analysis the potential impact of painting operations on painting personnel and on others involved in and adjacent to the work zone.

1.7.1 Toxic Materials

To protect personnel from overexposure to toxic materials, conform to the most stringent guidance of:

- a. The applicable manufacturer's Safety Data Sheets (SDS) or local regulation.
- b. 29 CFR 1910.1000.
- c. ACGIH 0100, threshold limit values.

Submit manufacturer's Safety Data Sheets for coatings, solvents, and other potentially hazardous materials, as defined in FED-STD-313.

1.8 ENVIRONMENTAL REQUIREMENTS

Comply, at minimum, with manufacturer recommendations for space ventilation during and after installation.

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1.8.1 Coatings

Do not apply coating when air or substrate conditions are:

- a. Less than 5 degrees F above dew point;
- b. Below 50 degrees F or over 95 degrees F, unless specifically pre-approved by the Contracting Officer and the product manufacturer. Do not, under any circumstances, violate the manufacturer's application recommendations.

1.8.2 Post-Application

Vacate space for as long as possible after application. Wait a minimum of 48 hours before occupying freshly painted rooms. Maintain one of the following ventilation conditions during the curing period, or for 72 hours after application:

- a. Supply 100 percent outside air 24 hours a day.
- b. Supply airflow at a rate of 6 air changes per hour, when outside temperatures are between 55 degrees F and 85 degrees F and humidity is between 30 percent and 60 percent.
- c. Supply airflow at a rate of 1.5 air changes per hour, when outside air conditions are not within the range stipulated above.

PART 2 PRODUCTS

2.1 MATERIALS

Conform to the coating specifications and standards referenced in PART 3. Submit Product Data Sheets for specified coatings and solvents. Provide preprinted cleaning and maintenance instructions for all coating systems. Submit Manufacturer's Instructions on Mixing: Detailed mixing instructions, minimum and maximum application temperature and humidity, pot life, and curing and drying times between coats.

2.2 COLOR SELECTION OF FINISH COATS

Provide colors of finish coats as indicated or specified. Allow Contracting Officer to select colors not indicated or specified. Manufacturers' names and color identification are used for the purpose of color identification only. Named products are acceptable for use only if they conform to specified requirements. Products of other manufacturers are acceptable if the colors are approximately the colors indicated and the product conforms to specified requirements.

Provide color, texture, and pattern of wall coating systems as indicated. Submit manufacturer's samples of paint colors. Cross reference color samples to color scheme as indicated. Submit color stencil codes. Tint each coat progressively darker to enable confirmation of the number of coats.

PART 3 EXECUTION

3.1 PROTECTION OF AREAS AND SPACES NOT TO BE PAINTED

Prior to surface preparation and coating applications, remove, mask, or

Technical Specifications

otherwise protect hardware, hardware accessories, machined surfaces, radiator covers, plates, lighting fixtures, public and private property, and other such items not to be coated that are in contact with surfaces to be coated. Following completion of painting, reinstall removed items by workmen skilled in the trades. Restore surfaces contaminated by coating materials, to original condition and repair damaged items.

3.2 SURFACE PREPARATION

Remove dirt, splinters, loose particles, grease, oil, disintegrated coatings, and other foreign matter and substances deleterious to coating performance as specified for each substrate before application of paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Schedule cleaning so that dust and other contaminants will not fall on wet, newly painted surfaces. Spot-prime exposed ferrous metals such as nail heads on or in contact with surfaces to be painted with water-thinned paints, with a suitable corrosion-inhibitive primer capable of preventing flash rusting and compatible with the coating specified for the adjacent areas. Refer to MPI ASM and MPI MRM for additional more specific substrate preparation requirements.

3.2.1 Additional Requirements for Preparation of Surfaces With Existing Coatings

Before application of coatings, perform the following on surfaces covered by soundly-adhered coatings, defined as those which cannot be removed with a putty knife:

- a. Test existing finishes for lead before sanding, scraping, or removing. If lead is present, refer to paragraph Toxic Materials.
- b. Wipe previously painted surfaces to receive solvent-based coatings, except stucco and similarly rough surfaces clean with a clean, dry cloth saturated with mineral spirits, ASTM D235 or as specified in MPI MRM. Wipe the surfaces dry with a clean, dry, lint free cloth. Wipe immediately preceding the application of the first coat of any coating, unless specified otherwise.
- c. Sand existing glossy surfaces to be painted to reduce gloss. Brush, and wipe clean with a damp cloth to remove dust.
- d. The requirements specified are minimum. Comply also with the application instructions of the paint manufacturer and specific surface preparation requirements as outlined in MPI MRM Exterior Surface Preparation and Interior Surface Preparation.
- e. Thoroughly clean previously painted surfaces specified to be repainted of all grease, dirt, dust or other foreign matter.
- f. Remove blistering, cracking, flaking and peeling or otherwise deteriorated coatings.
- g. Remove chalk so that when tested in accordance with ASTM D4214, the chalk resistance rating is no less than 8.
- h. Roughen slick surfaces. Repair damaged areas such as, but not limited to, nail holes, cracks, chips, and spalls with suitable material to match adjacent undamaged areas.

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- i. Feather and sand smooth edges of chipped paint.
- j. Clean rusty metal surfaces in accordance with SSPC requirements. Use solvent, mechanical, or chemical cleaning methods to provide surfaces suitable for painting.
- k. Provide new, proposed coatings that are compatible with existing coatings.

3.2.2 Existing Coated Surfaces with Minor Defects

Sand, spackle, and treat minor defects to render them smooth. Minor defects are defined as scratches, nicks, cracks, gouges, spalls, alligating, chalking, and irregularities due to partial peeling of previous coatings.

3.2.3 Removal of Existing Coatings

Remove existing coatings from the following surfaces:

- a. Surfaces containing large areas of minor defects;
- b. Surfaces containing more than 20 percent peeling area; and
- c. Surfaces designated by the Contracting Officer, such as surfaces where rust shows through existing coatings.

3.2.4 Substrate Repair

- a. Repair substrate surface damaged during coating removal;
- b. Sand edges of adjacent soundly-adhered existing coatings so they are tapered as smooth as practical to areas involved with coating removal; and
- c. Clean and prime the substrate as specified.

3.3 PREPARATION OF METAL SURFACES

3.3.1 Existing and New Ferrous Surfaces

- a. Ferrous Surfaces including Shop-coated Surfaces and Small Areas That Contain Rust, Mill Scale and Other Foreign Substances: Solvent clean in accordance with SSPC SP 1 to remove oil and grease. Where shop coat is missing or damaged, clean according to SSPC SP 2, or SSPC SP 10/NACE No. 2. Brush-off blast remaining surface in accordance with SSPC 7/NACE No.4; Water jetting to SSPC-SP WJ-4/NACE WJ-4 may be used to remove loose coating and other loose materials. Use inhibitor as recommended by coating manufacturer to prevent premature rusting. Protect shop-coated ferrous surfaces from corrosion by treating and touching up corroded areas immediately upon detection.
- b. Surfaces With More Than 20 Percent Rust, Mill Scale, and Other Foreign Substances: Clean entire surface in accordance with SSPC SP 6/NACE No.3 / SSPC-SP WJ-3/NACE WJ-3.

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3.3.2 Final Ferrous Surface Condition:

3.3.2.1 Tool Cleaned Surfaces

Comply with SSPC SP 2 and SSPC SP 3. Use as a visual reference, photographs in SSPC VIS 3 for the appearance of cleaned surfaces.

3.3.2.2 Abrasive Blast Cleaned Surfaces

Comply with SSPC 7/NACE No.4, SSPC SP 6/NACE No.3, and SSPC SP 10/NACE No. 2. Use as a visual reference, photographs in SSPC VIS 1 for the appearance of cleaned surfaces.

3.3.2.3 Waterjet Cleaned Surfaces

Comply with SSPC-SP WJ-1/NACE WJ-1, SSPC-SP WJ-2/NACE WJ-2, SSPC-SP WJ-3/NACE WJ-3 or SSPC-SP WJ-4/NACE WJ-4. Use as a visual reference, photographs in SSPC VIS 4/NACE VIS 7 for the appearance of cleaned surfaces.

3.3.3 Galvanized Surfaces

- a. New or Existing Galvanized Surfaces With Only Dirt and Zinc Oxidation Products: Clean with solvent, in accordance with SSPC SP 1. Completely remove coating by brush-off abrasive blast if the galvanized metal has been passivated or stabilized. Do not "passivate" or "stabilize" new galvanized steel to be coated. If the absence of hexavalent stain inhibitors is not documented, test as described in ASTM D6386, Appendix X2, and remove by one of the methods described therein.
- b. Galvanized with Slight Coating Deterioration or with Little or No Rusting: Water jetting to SSPC-SP WJ-3/NACE WJ-3 to remove loose coating from surfaces with less than 20 percent coating deterioration and no blistering, peeling, or cracking. Use inhibitor as recommended by the coating manufacturer to prevent rusting.
- c. Galvanized With Severe Deteriorated Coating or Severe Rusting: Water jet to SSPC-SP WJ-3/NACE WJ-3 degree of cleanliness.

3.4 PREPARATION OF CONCRETE AND CEMENTITIOUS SURFACE

3.4.1 Concrete and Masonry

- a. Curing: Allow concrete, stucco and masonry surfaces to cure at least 30 days before painting, and concrete slab on grade to cure at least 90 days before painting.
- b. Surface Cleaning: Remove the following deleterious substances.
 - (1) Dirt, Chalking, Grease, and Oil: Wash new and existing uncoated surfaces with a solution composed of 1/2 cup trisodium phosphate, 1/4 cup household detergent, and 4 quarts of warm water. Then rinse thoroughly with fresh water. Wash existing coated surfaces with a suitable detergent and rinse thoroughly. For large areas, water blasting may be used.
 - (2) Fungus and Mold: Wash new surfaces with a solution composed of 1/2 cup trisodium phosphate, 1/4 cup household detergent, one quart

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5 percent sodium hypochlorite solution and 3 quarts of warm water. Rinse thoroughly with fresh water.

(3) Paint and Loose Particles: Remove by wire brushing.

(4) Efflorescence: Remove by scraping or wire brushing followed by washing with a 5 to 10 percent by weight aqueous solution of hydrochloric (muriatic) acid. Do not allow acid to remain on the surface for more than five minutes before rinsing with fresh water. Do not acid clean more than 4 square feet of surface, per workman, at one time.

c. Cosmetic Repair of Minor Defects: Repair or fill mortar joints and minor defects, including but not limited to spalls, in accordance with manufacturer's recommendations and prior to coating application.

d. Allowable Moisture Content: Latex coatings may be applied to damp surfaces, but not to surfaces with droplets of water. Do not apply epoxies to damp vertical surfaces as determined by ASTM D4263 or horizontal surfaces that exceed 3 lbs of moisture per 1000 square feet in 24 hours as determined by ASTM F1869. In all cases follow manufacturer's recommendations. Allow surfaces to cure a minimum of 30 days before painting.

3.4.2 Gypsum Board, Plaster, and Stucco

3.4.2.1 Surface Cleaning

Verify that plaster and stucco surfaces are free from loose matter and that gypsum board is dry. Remove loose dirt and dust by brushing with a soft brush, rubbing with a dry cloth, or vacuum-cleaning prior to application of the first coat material. A damp cloth or sponge may be used if paint is water-based.

3.4.2.2 Repair of Minor Defects

Prior to painting, repair joints, cracks, holes, surface irregularities, and other minor defects with patching plaster or spackling compound and sand smooth.

3.4.2.3 Allowable Moisture Content

Latex coatings may be applied to damp surfaces, but not surfaces with droplets of water. Do not apply epoxies to damp surfaces as determined by ASTM D4263. Verify that new plaster to be coated has a maximum moisture content of 8 percent, when measured in accordance with ASTM D4444, Method A, unless otherwise authorized. In addition to moisture content requirements, allow new plaster to age a minimum of 30 days before preparation for painting.

3.5 APPLICATION

3.5.1 Coating Application

a. Comply with applicable federal, state and local laws enacted to ensure compliance with Federal Clean Air Standards. Apply coating materials in accordance with SSPC PA 1. SSPC PA 1 methods are applicable to all substrates, except as modified herein.

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- b. At the time of application, paint must show no signs of deterioration. Maintain uniform suspension of pigments during application.
- c. Unless otherwise specified or recommended by the paint manufacturer, paint may be applied by brush, roller, or spray. Use trigger operated spray nozzles for water hoses. Use rollers for applying paints and enamels of a type designed for the coating to be applied and the surface to be coated. Wear protective clothing and respirators when applying oil-based paints or using spray equipment with any paints.
- d. Only apply paints, except water-thinned types, to surfaces that are completely free of moisture as determined by sight or touch.
- e. Thoroughly work coating materials into joints, crevices, and open spaces. Pay special attention to ensure that all edges, corners, crevices, welds, and rivets receive a film thickness equal to that of adjacent painted surfaces.
- f. Apply each coat of paint so that dry film is of uniform thickness and free from runs, drops, ridges, waves, pinholes or other voids, laps, brush marks, and variations in color, texture, and finish. Completely hide all blemishes.
- g. Touch up damaged coatings before applying subsequent coats.m. Drying Time: Allow time between coats, as recommended by the coating manufacturer, to permit thorough drying, but not to present topcoat adhesion problems. Provide each coat in specified condition to receive next coat.
- n. Primers, and Intermediate Coats: Do not allow primers or intermediate coats to dry more than 30 days, or longer than recommended by manufacturer, before applying subsequent coats. Follow manufacturer's recommendations for surface preparation if primers or intermediate coats are allowed to dry longer than recommended by manufacturers of subsequent coatings. Cover each preceding coat or surface completely by ensuring visually perceptible difference in shades of successive coats.
- o. Finished Surfaces: Provide finished surfaces free from runs, drops, ridges, waves, laps, brush marks, and variations in colors.
- p. Thermosetting Paints: Apply topcoats over thermosetting paints (epoxies and urethanes) within the overcoat window recommended by the manufacturer.

3.5.2 Mixing and Thinning of Paints

Reduce paints to proper consistency by adding fresh paint, except when thinning is mandatory to suit surface, temperature, weather conditions, application methods, or for the type of paint being used. Obtain written permission from the Contracting Officer to use thinners. Verify that the written permission includes quantities and types of thinners to use.

When thinning is allowed, thin paints immediately prior to application with not more than one pint of suitable thinner per gallon. The use of thinner does not relieve the Contractor from obtaining complete hiding,

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full film thickness, or required gloss. Thinning cannot cause the paint to exceed limits on volatile organic compounds. Do not mix paints of different manufacturers.

3.5.3 Two-Component Systems

Mix two-component systems in accordance with manufacturer's instructions. Follow recommendation by the manufacturer for any thinning of the first coat to ensure proper penetration and sealing for each type of substrate.

3.5.4 Coating Systems

- a. Systems by Substrates: Apply coatings that conform to the respective specifications listed in the following Tables:

Table for Exterior Applications	
MPI Division	Substrate Application
MPI Division 3	Exterior Concrete Paint Table
MPI Division 4	Exterior Concrete Masonry Units Paint Table
MPI Division 5	Exterior Metal, Ferrous and Non-Ferrous Paint Table
MPI Division 6	Exterior Wood; Dressed Lumber, Paneling, Decking, Shingles Paint Table
MPI Division 9	Exterior Stucco Paint Table
MPI Division 10	Exterior Cloth Coverings and Bituminous Coated Surfaces Paint Table

Table for Interior Applications	
MPI Division	Substrate Application
MPI Division 3	Interior Concrete Paint Table
MPI Division 4	Interior Concrete Masonry Units Paint Table
MPI Division 5	Interior Metal, Ferrous and Non-Ferrous Paint Table
MPI Division 6	Interior Wood Paint Table
MPI Division 9	Interior Plaster, Gypsum Board, Textured Surfaces Paint Table

- b. Minimum Dry Film Thickness (DFT): Apply paints, primers, varnishes, enamels, undercoats, and other coatings to a minimum dry film thickness of 1.5 mil each coat unless specified otherwise in the Tables. Coating thickness, where specified, refers to the minimum dry film thickness.
- c. Coatings for Surfaces Not Specified Otherwise: Coat unspecified

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surfaces the same as surfaces having similar conditions of exposure.

- d. Existing Surfaces Damaged During Performance of the Work, Including New Patches In Existing Surfaces: Coat surfaces with the following:
 - (1) One coat of primer.
 - (2) One coat of undercoat or intermediate coat.
 - (3) One topcoat to match adjacent surfaces.
- e. Existing Coated Surfaces To Be Painted: Apply coatings conforming to the respective specifications listed in the Tables herein, except that pretreatments, sealers and fillers need not be provided on surfaces where existing coatings are soundly adhered and in good condition. Do not omit undercoats or primers.

3.6 COATING SYSTEMS FOR METAL

Apply coatings of Tables in MPI Division 5 for Exterior and Interior.

- a. Apply specified ferrous metal primer to steel surfaces on the same day that surface is cleaned, to surfaces that meet all specified surface preparation requirements at time of application.
- b. Inaccessible Surfaces: Prior to erection, use one coat of specified primer on metal surfaces that will be inaccessible after erection.
- c. Shop-primed Surfaces: Touch up exposed substrates and damaged coatings to protect from rusting prior to applying field primer.
- d. Surface Previously Coated with Epoxy or Urethane: Apply MPI 101, 1.5 mils DFT immediately prior to application of epoxy or urethane coatings.
- e. Pipes and Tubing: The semitransparent film applied to some pipes and tubing at the mill is not to be considered a shop coat. Overcoat these items with the specified ferrous-metal primer prior to application of finish coats.
- f. Exposed Nails, Screws, Fasteners, and Miscellaneous Ferrous Surfaces. On surfaces to be coated with water thinned coatings, spot prime exposed nails and other ferrous metal with latex primer MPI 107.

3.7 COATING SYSTEMS FOR CONCRETE AND CEMENTITIOUS SUBSTRATES

Apply coatings of Tables in MPI Division 3, 4 and 9 for Exterior and Interior.

3.8 INSPECTION AND ACCEPTANCE

In addition to meeting previously specified requirements, demonstrate mobility of moving components, including swinging and sliding doors, cabinets, and windows with operable sash, for inspection by the Contracting Officer. Perform this demonstration after appropriate curing and drying times of coatings have elapsed and prior to invoicing for final payment.

3.9 WASTE MANAGEMENT

As specified in the Waste Management Plan and as follows. Do not use kerosene or any such organic solvents to clean up water based paints. Properly dispose of paints or solvents in designated containers. Close and seal partially used containers of paint to maintain quality as necessary for reuse. Store in protected, well-ventilated, fire-safe area at moderate temperature. Place materials defined as hazardous or toxic waste in designated containers. Coordinate with manufacturer for take-back program. Set aside scrap to be returned to manufacturer for recycling into new product. When such a service is not available, contact local recyclers to reclaim the materials.

-- End of Section --

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.
7. Handholes and boxes for exterior underground cabling.

B. Related Requirements:

1. Section 260543 "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.
2. Section 270528 "Pathways for Communications Systems" for conduits, wireways, surface pathways, innerduct, boxes, faceplate adapters, enclosures, cabinets, and handholes serving communications systems.
3. Section 280528 "Pathways for Electronic Safety and Security" for conduits, surface pathways, innerduct, boxes, and faceplate adapters serving electronic safety and security.

1.2 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. LEED Submittals:

1. Product Data for Credit IEQ 4.1: For solvent cements and adhesive primers, documentation including printed statement of VOC content.
2. Laboratory Test Reports for Credit IEQ 4: For solvent cements and adhesive primers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of conduit groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Seismic Qualification Certificates: For enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.

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PART 2 PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. GRC: Comply with ANSI C80.1 and UL 6.
- C. EMT: Comply with ANSI C80.3 and UL 797.
- D. FMC: Comply with UL 1; zinc-coated steel or aluminum.
- E. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- F. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
 2. Fittings for EMT:
 - a. Material: Steel.
 - b. Type: Setscrew or compression.
 3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
- G. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

- A. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ENT: Comply with NEMA TC 13 and UL 1653.
- C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- D. LFNC: Comply with UL 1660.
- E. Continuous HDPE: Comply with UL 651B.
- F. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
- G. Fittings for LFNC: Comply with UL 514B.
- H. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- I. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from

Various Sources Using Small-Scale Environmental Chambers."

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 3R unless otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

2.4 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

A. Listing and Labeling: Nonmetallic wireways and auxiliary gutters shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Description: Fiberglass polyester, extruded and fabricated to required size and shape, without holes or knockouts. Cover shall be gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections shall be flanged and have stainless-steel screws and oil-resistant gaskets.

C. Description: PVC, extruded and fabricated to required size and shape, and having snap-on cover, mechanically coupled connections, and plastic fasteners.

D. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.

E. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

F. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.5 SURFACE RACEWAYS

A. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5.

C. Surface Nonmetallic Raceways: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC. Product shall comply with UL 94 V-0 requirements for self-extinguishing characteristics.

2.6 BOXES, ENCLOSURES, AND CABINETS

A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes,

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enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

D. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

E. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

G. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum, galvanized, cast iron with gasketed cover.

H. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

I. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

J. Gangable boxes are allowed.

K. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 3R with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

2. Nonmetallic Enclosures: Plastic.

3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

L. Cabinets:

1. NEMA 250, Type 3R galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.

2. Hinged door in front cover with flush latch and concealed hinge.

3. Key latch to match panelboards.

4. Metal barriers to separate wiring of different systems and voltage.

5. Accessory feet where required for freestanding equipment.

6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.7 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.

2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

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1. Standard: Comply with SCTE 77.
2. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, "ELECTRIC."
6. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

C. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with frame and covers of polymer concrete.

1. Standard: Comply with SCTE 77.
2. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, "ELECTRIC."
6. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

PART 3 EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC or RNC, Type EPC-80-PVC.
2. Concealed Conduit, Aboveground: GRC or EMT.
3. Underground Conduit: RNC, Type EPC-40-PVC, concrete encased when specified.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFNC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated.

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:
 - a. Loading dock.
 - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - c. Mechanical rooms.
 - d. Gymnasiums.
4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: GRC.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet

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locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.

2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.

3. EMT: Use setscrew or compression], steel fittings. Comply with NEMA FB 2.10.

4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

F. Install surface raceways only where indicated on Drawings.

G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

D. Arrange stub-ups so curved portions of bends are not visible above finished slab.

E. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

F. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

G. Support conduit within 12 inches of enclosures to which attached.

H. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.

2. Arrange raceways to cross building expansion joints at right angles

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with expansion fittings.

3. Arrange raceways to keep a minimum of 3 inches of concrete cover in all directions.

4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.

I. Stub-ups to Above Recessed Ceilings:

1. Use RMC for raceways.

2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

J. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

K. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

L. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

N. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

O. Surface Raceways:

1. Install surface raceway with a minimum 2-inch radius control at bend points.

2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

P. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces.

Q. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Where otherwise required by NFPA 70.

R. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has

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straight-run length that exceeds 25 feet.

2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.

b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.

c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.

d. Attics: 135 deg F temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per degree F of temperature change for PVC conduits.

4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.

5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

S. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.

2. Use LFMC in damp or wet locations not subject to severe physical damage.

T. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

U. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between the box and cover plate or the supported equipment and box.

V. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

W. Locate boxes so that cover or plate will not span different building finishes.

X. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

Y. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

Z. Set metal floor boxes level and flush with finished floor surface.

AA. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

Technical Specifications

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches in nominal diameter.
2. Install backfill as specified in Section 312000 "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
4. Install manufactured duct elbows for stub-up at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
 - b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
6. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.
- D. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.7 PROTECTION

Technical Specifications

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

-- End of Section --

SECTION 26 05 43

UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Direct-buried conduit, ducts, and duct accessories.
2. Concrete-encased conduit, ducts, and duct accessories.
3. Handholes and boxes.

1.2 ACTION SUBMITTALS

A. Product Data: For ducts and conduits, duct-bank materials, manholes, handholes, and boxes, and their accessories.

B. Shop Drawings:

1. Precast or Factory-Fabricated Underground Utility Structures:
 - a. Include plans, elevations, sections, details, attachments to other work, and accessories.
 - b. Include duct entry provisions, including locations and duct sizes.
 - c. Include reinforcement and joint details, frame and cover design, and manhole frame support rings.
2. Factory-Fabricated Handholes and Boxes Other Than Precast Concrete:
 - a. Include dimensioned plans, sections, elevations, accessory locations, and fabrication and installation details.
 - b. Include duct entry provisions, including locations and duct sizes.

1.3 INFORMATIONAL SUBMITTALS

A. Duct-Bank Coordination Drawings: Show duct profiles, locations of expansion fittings, and coordination with other utilities and underground structures on Drawings signed and sealed by a qualified professional engineer.

B. Product Certificates: For concrete and steel used in precast concrete handholes, as required by ASTM C 858.

C. Qualification Data: For professional engineer and testing agency responsible for testing nonconcrete handholes and boxes.

D. Source quality-control reports.

E. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

1.5 FIELD CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted by Construction Manager, and then only after arranging to provide

Technical Specifications

temporary electrical service.

B. Ground Water: Assume ground-water level is 36 inches below ground surface unless a higher water table is noted on Drawings.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS FOR DUCTS AND RACEWAYS

A. Comply with ANSI C2.

2.2 CONDUIT

A. Rigid Steel Conduit: Galvanized. Comply with ANSI C80.1.

B. RNC: NEMA TC 2, Type EPC-40-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.

2.3 NONMETALLIC DUCTS AND DUCT ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ARNCO Corp.
2. Beck Manufacturing.
3. Cantex, Inc.
4. CertainTeed Corporation.
5. Condux International, Inc.
6. ElecSys, Inc.
7. Electri-Flex Company.
8. IPEX Inc.
9. Lamson & Sessions; Carlon Electrical Products.
10. Spiraduct/AFC Cable Systems, Inc.

B. Underground Plastic Utilities Duct: NEMA TC 2, UL 651, ASTM F 512, Type EPC-40, with matching fittings complying with NEMA TC 3 by same manufacturer as the duct.

C. Duct Accessories:

1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers.
2. Warning Tape: Underground-line warning tape specified in Section 260553 "Identification for Electrical Systems."

2.4 PRECAST CONCRETE HANDHOLES AND BOXES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Christy Concrete Products.
2. Elmhurst-Chicago Stone Co.
3. Oldcastle Precast Group.
4. Rinker Group, Ltd.
5. Riverton Concrete Products.
6. Utility Concrete Products, LLC.
7. Utility Vault Co.
8. Wausau Tile Inc.

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B. Comply with ASTM C 858 for design and manufacturing processes.

C. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover shall form top of enclosure and shall have load rating consistent with that of handhole or box.

1. Frame and Cover: Weatherproof cast-iron frame, with cast-iron cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.

2. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.

3. Cover Legend: Molded lettering, "ELECTRIC."

4. Configuration: Units shall be designed for flush burial and have closed bottom unless otherwise indicated.

5. Extensions and Slabs: Designed to mate with bottom of enclosure. Same material as enclosure.

a. Extension shall provide increased depth of 12 inches.

b. Slab: Same dimensions as bottom of enclosure and arranged to provide closure.

6. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.

7. Windows: Precast, reinforced openings in walls, arranged to match dimensions and elevations of approaching ducts and duct banks, plus an additional 12 inches vertically and horizontally to accommodate alignment variations.

8. Duct Entrances in Handhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.

9. Handholes 12 inches wide by 24 inches long and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.5 HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. General Requirements for Handholes and Boxes: Comply with SCTE 77. Comply with tier requirements in "Underground Enclosure Application" Article.

1. Color: Green.

2. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.

3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.

4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.

5. Cover Legend: Molded lettering, "ELECTRIC."

6. Handholes 12 inches wide by 24 inches long and larger shall have factory-installed inserts for cable racks and pulling-in irons.

B. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with covers made of fiberglass.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Carson Industries LLC.

b. Christy Concrete Products.

c. Nordic Fiberglass, Inc.

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d. Quazite: Hubbell Power System, Inc.

C. High-Density Plastic Boxes: Injection molded of high-density polyethylene or copolymer-polypropylene. Cover shall be made of plastic.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. Carson Industries LLC.
- b. Nordic Fiberglass, Inc.
- c. PenCell Plastics.
- d. Quazite: Hubbell Power System, Inc.

PART 3 EXECUTION

3.1 UNDERGROUND DUCT APPLICATION

A. Ducts for Electrical Cables More than 600 V: RNC, NEMA Type EPC-40-PVC, in concrete-encased duct bank unless otherwise indicated.

B. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank unless otherwise indicated.

C. Ducts for Electrical Branch Circuits: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank unless otherwise indicated.

D. Underground Ducts Crossing Roadways: RNC, NEMA Type EPC-40-PVC, encased in reinforced concrete.

3.2 UNDERGROUND ENCLOSURE APPLICATION

A. Handholes and Boxes for 600 V and Less:

1. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Polymer concrete, SCTE 77, Tier 15 structural load rating.

2. Units in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Polymer concrete units, SCTE 77, Tier 8 or Heavy-duty fiberglass units with polymer concrete frame and cover, SCTE 77, Tier 8 structural load rating.

3. Units Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin or High-density plastic], structurally tested according to SCTE 77 with 3000-lbf vertical loading.

4. Cover design load shall not exceed the design load of the handhole or box.

3.3 EARTHWORK

A. Excavation and Backfill: Comply with Section 312000 "Earth Moving," but do not use heavy-duty, hydraulic-operated, compaction equipment.

B. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching. Comply with Section 329200 "Turf and Grasses" and Section 329300 "Plants."

C. Cut and patch existing pavement in the path of underground ducts and utility structures according to the "Cutting and Patching" Article in Section 017300 "Execution."

3.4 DUCT INSTALLATION

Technical Specifications

- A. Install ducts according to NEMA TCB 2.
- B. Slope: Pitch ducts a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes, to drain in both directions.
- C. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches, both horizontally and vertically, at other locations unless otherwise indicated.
- D. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.
- E. Installation Adjacent to High-Temperature Steam Lines: Where duct banks are installed parallel to underground steam lines, perform calculations showing the duct bank will not be subject to environmental temperatures above 40 deg C. Where environmental temperatures are calculated to rise above 40 deg C, and anywhere the duct bank crosses above an underground steam line, install insulation blankets listed for direct burial to isolate the duct bank from the steam line.
- F. Duct Entrances to Manholes and Concrete and Polymer Concrete Handholes: Use end bells, spaced approximately 10 inches o.c. for 4-inch ducts, and vary proportionately for other duct sizes.
1. Begin change from regular spacing to end-bell spacing 10 feet from the end bell without reducing duct line slope and without forming a trap in the line.
 2. Direct-Buried Duct Banks: Install an expansion and deflection fitting in each conduit in the area of disturbed earth adjacent to manhole or handhole. Install an expansion fitting near the center of all straight line direct-buried duct banks with calculated expansion of more than 3/4 inch.
 3. Grout end bells into structure walls from both sides to provide watertight entrances.
- G. Building Wall Penetrations: Make a transition from underground duct to rigid steel conduit at least 10 feet outside the building wall, without reducing duct line slope away from the building, and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition. Install conduit penetrations of building walls as specified in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."
- H. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig hydrostatic pressure.
- I. Pulling Cord: Install 100-lbf- test nylon cord in empty ducts.
- J. Concrete-Encased Ducts: Support ducts on duct separators.
1. Excavate trench bottom to provide firm and uniform support for duct bank. Prepare trench bottoms as specified in Section 312000 "Earth Moving" for pipes less than 6 inches in nominal diameter.
 2. Depth: Install top of duct bank at least 36 inches below finished grade in areas not subject to deliberate traffic, and at least 36 inches below finished grade in deliberate traffic paths for vehicles unless otherwise indicated.

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3. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.

4. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts, with not less than four spacers per 20 feet of duct. Secure separators to earth and to ducts to prevent floating during concreting. Stagger separators approximately 6 inches between tiers. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.

5. Minimum Space between Ducts: 3 inches between ducts and exterior envelope wall, 2 inches between ducts for like services, and 12 inches between power and signal ducts.

6. Elbows: Use manufactured rigid steel conduit elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run.

a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.

b. Stub-Ups to Equipment: For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of base. Install insulated grounding bushings on terminations at equipment.

7. Reinforcement: Reinforce concrete-encased duct banks where they cross disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.

8. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.

9. Concrete Cover: Install a minimum of 3 inches of concrete cover at top and bottom, and a minimum of 2 inches on each side of duct bank.

10. Pouring Concrete: Comply with requirements in "Concrete Placement" Article in Section 033000 "Cast-in-Place Concrete." Place concrete carefully during pours to prevent voids under and between conduits and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto ducts. Allow concrete to flow to center of bank and rise up in middle, uniformly filling all open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-bank application.

K. Direct-Buried Duct Banks:

1. Excavate trench bottom to provide firm and uniform support for duct bank. Comply with requirements in Section 312000 "Earth Moving" for preparation of trench bottoms for pipes less than 6 inches in nominal diameter.

2. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.

3. Space separators close enough to prevent sagging and deforming of ducts, with not less than five spacers per 20 feet of duct. Secure separators to earth and to ducts to prevent displacement during backfill and yet permit linear duct movement due to expansion and contraction as temperature changes. Stagger spacers approximately 6 inches between tiers.

4. Depth: Install top of duct bank at least 36 inches below finished grade unless otherwise indicated.

5. Set elevation of bottom of duct bank below frost line.

6. Install ducts with a minimum of 3 inches between ducts for like services and 12 inches between power and signal ducts.

7. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run.

a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.

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b. For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

8. After installing first tier of ducts, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand place backfill to 4 inches over ducts and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction. Comply with requirements in Section 312000 "Earth Moving" for installation of backfill materials.

a. Place minimum 3 inches of sand as a bed for duct bank. Place sand to a minimum of 6 inches above top level of duct bank.

L. Warning Tape: Bury warning tape approximately 12 inches above all concrete-encased ducts and duct banks. Align tape parallel to and within 3 inches of centerline of duct bank. Provide an additional warning tape for each 12-inch increment of duct-bank width over a nominal 18 inches. Space additional tapes 12 inches apart, horizontally.

3.5 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting ducts, to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of ducts, and seal joint between box and extension as recommended by manufacturer.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas and trafficways, set cover flush with finished grade. Set covers of other handholes 1 inch above finished grade.

D. Install handholes and boxes with bottom below frost line, below grade.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in enclosure.

F. Field cut openings for ducts and conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.6 GROUNDING

A. Ground underground ducts and utility structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

3.7 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

Technical Specifications

1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
 2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide a minimum 6-inch- long mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.
 3. Test manhole and handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Correct deficiencies and retest as specified above to demonstrate compliance.

3.8 CLEANING

- A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.
- B. Clean internal surfaces of manholes, including sump. Remove foreign material.

-- End of Section --

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

1.2 ACTION SUBMITTALS

- A. Product Data: For each electrical identification product indicated.

1.3 QUALITY ASSURANCE

- A. Comply with ANSI A13.1.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

PART 2 PRODUCTS

2.1 POWER RACEWAY IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
- B. Colors for Raceways Carrying Circuits at 600 V or Less:
1. Black letters on an orange field.
 2. Legend: Indicate voltage and system or service type.
- C. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- D. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- E. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V

Technical Specifications

or Less: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

2.2 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

D. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

2.3 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.4 FLOOR MARKING TAPE

A. 2-inch- wide, 5-mil pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.

2.5 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.

2. Printing on tape shall be permanent and shall not be damaged by burial operations.

3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.

2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE.

3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.

2.6 WARNING LABELS AND SIGNS

Technical Specifications

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.
- C. Baked-Enamel Warning Signs:
 - 1. Preprinted aluminum signs punched or drilled for fasteners, with colors, legend, and size required for application.
 - 2. 1/4-inch grommets in corners for mounting.
 - 3. Nominal size, 7 by 10 inches.
- D. Warning label and sign shall include, but are not limited to, the following legends:
 - 1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
 - 2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

2.7 INSTRUCTION SIGNS

- A. Engraved, laminated acrylic or melamine plastic, minimum 1/16-inch-thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.
 - 1. Engraved legend with black letters on white face.
 - 2. Punched or drilled for mechanical fasteners.
 - 3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.
- B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.
- C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

2.8 EQUIPMENT IDENTIFICATION LABELS

- A. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.
- B. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.
- C. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Apply identification devices to surfaces that require finish after completing finish work.
- C. methods recommended by manufacturer of identification device.
- D. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- E. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- F. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.
- G. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

- A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Install labels at 30-foot maximum intervals.
- B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
 - 1. Emergency Power.
 - 2. Power.
 - 3. UPS.
- C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
 - 1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.
 - a. Color shall be factory applied or field applied for sizes larger than No. 4 AWG, if authorities having jurisdiction permit.
 - b. Colors for 208/120-V Circuits:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - c. Colors for 480/277-V Circuits:

Technical Specifications

- 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
- d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- D. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
- E. Conductors to Be Extended in the Future: Attach marker tape to conductors and list source.
- F. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
- G. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
1. Limit use of underground-line warning tape to direct-buried cables.
 2. Install underground-line warning tape for both direct-buried cables and cables in raceway.
- H. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- I. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Baked-enamel warning signs.
1. Comply with 29 CFR 1910.145.
 2. Identify system voltage with black letters on an orange background.
 3. Apply to exterior of door, cover, or other access.
 4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
 - a. Power transfer switches.
 - b. Controls with external control power connections.
- J. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- K. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- high letters for emergency instructions at equipment used for power transfer.
- L. Equipment Identification Labels: On each unit of equipment, install

Technical Specifications

unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

a. Indoor Equipment: laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high.

b. Outdoor Equipment: Engraved, laminated acrylic or melamine label 4 inches high.

c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.

d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

-- End of Section --

SECTION 26 56 00

EXTERIOR LIGHTING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior luminaires with lamps and ballasts.
2. Luminaire-mounted photoelectric relays.
3. Poles and accessories.

1.2 STRUCTURAL ANALYSIS CRITERIA FOR POLE SELECTION

A. Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied as stated in AASHTO LTS-4-M.

B. Live Load: Single load of 500 lbf, distributed as stated in AASHTO LTS-4-M.

C. Ice Load: Load of 3 lbf/sq. ft., applied as stated in AASHTO LTS-4-M Ice Load Map.

D. Wind Load: Pressure of wind on pole and luminaire and banners and banner arms, calculated and applied as stated in AASHTO LTS-4-M.

1. Basic wind speed for calculating wind load for poles exceeding 49.2 feet in height is 150 mph.

- a. Wind Importance Factor: 1.0
- b. Minimum Design Life: 50 years.
- c. Velocity Conversion Factors: 1.0.

2. Basic wind speed for calculating wind load for poles 50 feet high or less is 150 mph.

- a. Wind Importance Factor: 1.0.
- b. Minimum Design Life: 25 years
- c. Velocity Conversion Factors: 1.0

1.3 ACTION SUBMITTALS

A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, and finishes.

B. Shop Drawings: Anchor-bolt templates keyed to specific poles and certified by manufacturer.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with IEEE C2, "National Electrical Safety Code."

C. Comply with NFPA 70.

Technical Specifications

PART 2 PRODUCTS

1.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide product indicated on Drawings

1.2 GENERAL REQUIREMENTS FOR LUMINAIRES

A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.

1. LER Tests Incandescent Fixtures: Where LER is specified, test according to NEMA LE 5A.

2. LER Tests HID Fixtures: Where LER is specified, test according to NEMA LE 5B.

B. Lateral Light Distribution Patterns: Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.

C. Metal Parts: Free of burrs and sharp corners and edges.

D. Sheet Metal Components: Corrosion-resistant aluminum unless otherwise indicated. Form and support to prevent warping and sagging.

E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.

F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.

G. Exposed Hardware Material: Stainless steel.

H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

I. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.

J. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.

K. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

L. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

M. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's

Technical Specifications

"Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."

2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.

a. Color: As selected from manufacturer's standard catalog of colors.

N. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20; and seal aluminum surfaces with clear, hard-coat wax.

3. Class I, Clear Anodic Finish: AA-M32C22A41 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

4. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.

a. Color: Dark bronze.

O. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp and ballast characteristics:

a. "USES ONLY" and include specific lamp type.

b. Lamp tube configuration (twin, quad, triple), base type, and nominal wattage for compact fluorescent luminaires.

c. Start type (preheat, rapid start, instant start) compact fluorescent luminaires.

d. ANSI ballast type (M98, M57, etc.) for HID luminaires.

e. CCT and CRI for all luminaires.

1.3 GENERAL REQUIREMENTS FOR POLES AND SUPPORT COMPONENTS

A. Structural Characteristics: Comply with AASHTO LTS-4-M.

1. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in "Structural Analysis Criteria for Pole Selection" Article.

2. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection strength analysis.

B. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.

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C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.

1. Materials: Shall not cause galvanic action at contact points.
2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.
3. Anchor-Bolt Template: Plywood or steel.

D. Handhole: Oval-shaped, with minimum clear opening of 2-1/2 by 5 inches, with cover secured by stainless-steel captive screws.

E. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."

F. Power-Installed Screw Foundations: Factory fabricated by pole manufacturer, with structural steel complying with ASTM A 36/A 36M and hot-dip galvanized according to ASTM A 123/A 123M; and with top-plate and mounting bolts to match pole base flange and strength required to support pole, luminaire, and accessories.

G. Breakaway Supports: Frangible breakaway supports, tested by an independent testing agency acceptable to authorities having jurisdiction, according to AASHTO LTS-4-M.

1.4 STEEL POLES

A. Poles: Comply with ASTM A 500, Grade B, carbon steel with a minimum yield of 46,000 psig ; one-piece construction up to 40 feet in height with access handhole in pole wall.

1. Shape: Round, tapered.
2. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.

B. Steel Mast Arms: luminaire brackets in "Brackets for Luminaires" Paragraph below. Delete paragraph if luminaire brackets are adequately described in the Exterior Lighting Device Schedule or in details on Drawings.

- C. Brackets for Luminaires: Detachable, cantilever, without underbrace.
1. Adapter fitting welded to pole, allowing the bracket to be bolted to the pole mounted adapter, then bolted together with galvanized-steel bolts.
 2. Cross Section: Tapered oval, with straight tubular end section to accommodate luminaire.
 3. Match pole material and finish.

D. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.

E. Grounding and Bonding Lugs: Welded 1/2-inch threaded lug, complying with requirements in Section 260526 "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.

F. Cable Support Grip: Wire-mesh type with rotating attachment eye, sized for diameter of cable and rated for a minimum load equal to weight of supported cable times a 5.0 safety factor.

G. Prime-Coat Finish: Manufacturer's standard prime-coat finish ready for field painting.

Technical Specifications

H. Galvanized Finish: After fabrication, hot-dip galvanize complying with ASTM A 123/A 123M.

I. Factory-Painted Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or with SSPC-SP 8, "Pickling."

2. Interior Surfaces of Pole: One coat of bituminous paint, or otherwise treat for equal corrosion protection.

3. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.

a. Color: As indicated by manufacturer's designations.

PART 3 EXECUTION

3.1 LUMINAIRE INSTALLATION

A. Install lamps in each luminaire.

B. Fasten luminaire to indicated structural supports.

1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

C. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.

3.2 POLE INSTALLATION

A. Alignment: Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.

B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features unless otherwise indicated on Drawings:

1. Fire Hydrants and Storm Drainage Piping: 60 inches.
2. Water, Gas, Electric, Communication, and Sewer Lines: 10 feet.
3. Trees: 15 feet from tree trunk.

C. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Section 033000 "Cast-in-Place Concrete."

D. Foundation-Mounted Poles: Mount pole with leveling nuts, and tighten top nuts to torque level recommended by pole manufacturer.

1. Use anchor bolts and nuts selected to resist seismic forces defined for the application and approved by manufacturer.

2. Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.

3. Install base covers unless otherwise indicated.

4. Use a short piece of 1/2-inch-diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.

Technical Specifications

E. Embedded Poles with Tamped Earth Backfill: Set poles to depth below finished grade indicated on Drawings, but not less than one-sixth of pole height.

1. Dig holes large enough to permit use of tampers in the full depth of hole.

2. Backfill in 6-inch layers and thoroughly tamp each layer so compaction of backfill is equal to or greater than that of undisturbed earth.

F. Embedded Poles with Concrete Backfill: Set poles in augered holes to depth below finished grade indicated on Drawings, but not less than one-sixth of pole height.

1. Make holes 6 inches in diameter larger than pole diameter.

2. Fill augered hole around pole with air-entrained concrete having a minimum compressive strength of 3000 psi at 28 days, and finish in a dome above finished grade.

3. Use a short piece of 1/2-inch- diameter pipe to make a drain hole through concrete dome. Arrange to drain condensation from interior of pole.

4. Cure concrete a minimum of 72 hours before performing work on pole.

G. Poles and Pole Foundations Set in Concrete Paved Areas: Install poles with minimum of 6-inch- wide, unpaved gap between the pole or pole foundation and the edge of adjacent concrete slab. Fill unpaved ring with pea gravel to a level 1 inch below top of concrete slab.

H. Raise and set poles using web fabric slings (not chain or cable).

3.3 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch-thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.4 GROUNDING

A. Ground metal poles and support structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

1. Install grounding electrode for each pole unless otherwise indicated.

2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

B. Ground nonmetallic poles and support structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

1. Install grounding electrode for each pole.

2. Install grounding conductor and conductor protector.

3. Ground metallic components of pole accessories and foundations.

-- End of Section --

SECTION 26 56 68

EXTERIOR ATHLETIC LIGHTING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes lighting for the following outdoor sports venues:

1. Baseball fields.
2. Softball fields.
3. Football fields.
4. Soccer fields.
5. Outdoor tennis courts.

1.2 DEFINITIONS

A. CV: Coefficient of variation; a statistical measure of the weighted average of all relevant illumination values for the playing area, expressed as the ratio of the standard deviation for all illuminance values to the mean illuminance value.

B. LLD: Lamp lumen depreciation, which is the decrease in lamp output as the lamp ages.

C. LLF: Light loss factor, which is the product of all factors that contribute to light loss in the system.

D. UG: Uniformity gradient; the rate of change of illuminance on the playing field, expressed as a ratio between the illuminances of adjacent measuring points on a uniform grid.

1.3 PERFORMANCE REQUIREMENTS

A. Facility Type: Recreational or social facility.

B. Illumination Criteria:

1. Minimum average target illuminance level for each lighted area for each sports venue and for the indicated class of play according to IESNA RP-6.
2. CV and maximum-to-minimum uniformity ratios for each lighted area equal to or less than those listed in IESNA RP-6 for the indicated class of play.
3. UG levels within each lighted area equal to or less than those listed in IESNA RP-6 for the indicated speed of sport.

C. Illumination Calculations: Computer-analyzed point method complying with IESNA RP-6 to optimize selection, location, and aiming of luminaires.

1. Grid Pattern Dimensions: For playing areas of each sport and areas of concern for spill-light control, correlate and reference calculated parameters to the grid areas. Each grid point represents the center of the grid area defined by the length and width of the grid spacing.

2. Spill-Light Control: Minimize spill light for each playing area on adjacent and nearby areas.

- a. Prevent light trespass on properties near Project.
- b. For areas indicated on Drawings as "spill-light critical," limit the level of illuminance directed into the area from any luminaire or group

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of luminaires, and measured 36 inches above grade to the following:

- 1) Maximum Horizontal Illuminance: 0.25 fc.
- 2) Maximum Vertical Illuminance from the Direction of the Greatest Contribution of Light: 1.0 fc
- c. Calculate the horizontal and vertical illuminance due to spill light for points spaced 20 feet apart in areas indicated on Drawings as "spill-light critical," to ensure that design meets the above limits.
3. Glare Control: Design illumination for each playing area to minimize direct glare in adjacent and nearby areas.
 - a. Design source intensity of luminaires that may be observed at an elevation of 60 inches above finished grade from nearby properties to be less than 12,000 candela when so observed.
4. Determine LLF according to IESNA RP-6 and manufacturer's test data.
 - a. Use LLD at 100 percent of rated lamp life. LLF shall be applied to initial illumination to ensure that target illumination is achieved at 100 percent of lamp life and shall include consideration of field factor.
 - b. LLF shall not be higher than 70 percent, and may be lower when determined by manufacturer after application of the ballast output and optical system output according to IESNA RP-6.
5. Luminaire Mounting Height: Comply with IESNA RP-6, with consideration for requirements to minimize spill light and glare].
6. Luminaire Placement: Luminaire clusters shall be outside the glare zones defined by IESNA RP-6.

D. Baseball Fields:

1. IESNA RP-6, Class of Play: II.
2. Speed of Sport: Moderate.
3. Grid Pattern Dimensions: 30 by 30 feet.

E. Lighting Control: Manual, low voltage, or digital; providing the following functions, integrated into a single control station, with multiple subcontrol stations as indicated:

1. Control Station: Key-operated master switch, manual push-button controls, and system status indicator lights.

F. Electric Power Distribution Requirements:

1. Electric Power: 120/240 V; single phase.
 - a. Include roughing-in of service indicated for nonsports improvements on Project site.
 - b. Balance load between phases. Install wiring to balance three phases at each support structure.
 - c. Include required overcurrent protective devices and individual lighting control for each sports field or venue.
 - d. Include indicated feeder capacity and panelboard provisions for future lighted sports field construction.

G. Seismic Performance: Luminaires, ballasts, and support structures shall withstand the effects of earthquake motions determined according to ASCE/SEI

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of lighting product indicated. Include the following:

1. Lamp life, output, and energy-efficiency data. Lamp data certified

Technical Specifications

by NVLAP or NRTL; comply with IESNA LM-47.

2. Photometric data based on laboratory tests of each luminaire type, complete with lamps, ballasts, and accessories; comply with IESNA LM-5.

a. Photometric data shall be certified by manufacturer's laboratory with a current accreditation under the NVLAP for Energy Efficient Lighting Products.

B. Delegated-Design Submittal: For exterior athletic lighting indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Drawings and specifications for construction of lighting system.

2. Manufacturer's determination of LLF used in design calculations.

3. Lighting system design calculations for the following:

a. Target illuminance.

b. Point calculations of horizontal and vertical illuminance, CV, and UG at minimum grid size and area.

c. Point calculations of horizontal and vertical illuminance in indicated areas of concern for spill light.

d. Calculations of source intensity of luminaires observed at eye level from indicated properties near the playing fields.

4. Electrical system design calculations for the following:

a. Short-circuit current calculations for rating of panelboards.

b. Total connected and estimated peak-demand electrical load, in kilowatts, of lighting system.

c. Capacity of feeder required to supply lighting system.

5. Wiring requirements, including required conductors and cables and wiring methods.

6. Structural analysis data and calculations used for pole selection.

a. Manufacturer Wind-Load Strength Certification: Submit certification that selected total support system, including poles, complies with AASHTO LTS-4-M for location of Project.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer, manufacturer.

B. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Manufacturer Certificates: For support structures, including brackets, arms, appurtenances, bases, anchorages, and foundations, from manufacturer.

D. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For sports lighting system components to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

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B. Manufacturer Qualifications: Manufacturer's responsibilities include fabricating sports lighting and providing professional engineering services needed to assume engineering responsibility.

1. Engineering Responsibility: Preparation of delegated-design submittals and comprehensive engineering analysis by a qualified professional engineer.

C. Luminaire Photometric Data Testing Laboratory: By manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

D. Field Testing Agency Qualifications: A qualified independent professional engineer not associated with Contractor or lighting equipment manufacturer.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 2 PRODUCTS

2.1 LUMINAIRES, LAMPS, AND BALLASTS

A. Luminaires: Listed and labeled, by an NRTL acceptable to authorities having jurisdiction, for compliance with UL 1598 for installation in wet locations.

1. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without using tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent their accidental falling during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lens.

2. Exposed Hardware: Stainless-steel latches, fasteners, and hinges.

3. Spill-Light Control Devices: Internal louvers and external baffles furnished by manufacturer and designed for secure attachment to specific luminaire.

2.2 SUPPORT STRUCTURES

A. Support-Structure Wind-Load Strength: Poles and other support structures, brackets, arms, appurtenances, bases, anchorages, and foundations shall comply with AASHTO LTS-4-M and shall be certified by manufacturers to withstand winds up to 175 mph without permanent deflection or whipping.

B. Support-Structure Seismic Strength: Poles or other support structures, brackets, arms, appurtenances, bases, anchorages, and foundations shall be designed to prevent separation of components or fracture of poles, luminaire supports, or pole foundations during a seismic event.

C. Mountings, Fasteners, and Appurtenances:

1. Corrosion resistant, compatible with support components, and which shall not cause galvanic action at contact points.

a. Steel Components: Hot-dip galvanized after fabrication, complying with ASTM A 123/A 123M.

b. Mounting Hardware Fasteners: Hot-dip galvanized, complying with ASTM A 153/A 153M, or minimum 18-8 grade stainless steel.

2. Accommodate attachments and wiring of other indicated systems.

Technical Specifications

D. Concrete for Pole Foundations: 3000-psi, 28-day minimum compressive strength. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."

E. Direct-buried steel structures or poles shall not be used.

2.3 POWER DISTRIBUTION AND CONTROL

A. Wiring Method for Feeders, Subfeeders, Branch Circuits, and Control Wiring: Underground nonmetallic raceway; No. 10 AWG minimum conductor size for power wiring.

B. Electrical Enclosures Exposed to Weather: NEMA 250, Type 3R enclosure constructed from corrosion-resistant material, with hinged doors fitted with padlock hasps or lockable latches.

2.4 SURGE PROTECTION

A. Surge Protection: Comply with requirements in Section 264313 "Transient-Voltage Suppression for Low-Voltage Electrical Power Circuits" and include surge suppressors with the following requirements:

1. Panelboard type.

PART 3 EXECUTION

3.1 INSTALLATION

A. Use web fabric slings (not chain or cable) to raise and set structural members. Protect equipment during installation to prevent corrosion.

B. Install poles and other structural units level, plumb, and square.

C. Except for embedded structural members, grout void between pole base and foundation. Use nonshrinking or expanding concrete grout firmly packed in entire void space. Use a short piece of 1/2-inch- diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole. Nonshrink grout is specified in Section 055000 "Metal Fabrications."

D. Install controls and ballast housings in cabinets mounted on support structure at least 10 feet above finished grade.

3.2 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests, inspections, and analysis.

B. Perform tests, inspections, and analysis according to IESNA RP-6 and IESNA LM-5 where applicable.

C. Tests and Inspections:

1. After installing sports lighting system and after electrical circuits have been energized, perform proof-of-performance field measurements and analysis for compliance with requirements.

2. Playing and Other Designated Areas: Make field measurements at intersections of grids, dimensioned and located as specified in "Performance Requirements" Article and as described below:

- a. Baseball Fields: Measure at least 25 points of the infield and 87 points of the outfield. Extend the grid 15 feet outside the foul lines, extending to outfield boundary or fence.

Technical Specifications

3. Make field measurements at established test points in areas of concern for spill light and glare.

D. Correction of Illumination Deficiencies for Playing Areas: Make corrections to illumination quality or quantity, measured in field quality-control tests, that varies from specified illumination criteria by plus or minus 10 percent.

1. Add or replace luminaires, or change mounting height, revise aiming, or install louvers, shields, or baffles.

2. If luminaires are added or mounting height is changed, revise aiming and recalculate and modify or replace support structures if indicated.

3. Do not replace luminaires with units of higher or lower wattage without Architect's approval.

4. Retest as specified above after repairs, adjustments, or replacements are made.

5. Report results in writing.

E. Correction of Excessive Illumination in Spill-Light-Critical Areas: If measurements indicate that specified limits for spill light are exceeded, make corrections to illumination quantity, measured in field quality-control tests, that reduce levels to within specified maximum values.

1. Replace luminaires, or change mounting heights, revise aiming, or install louvers, shields, or baffles.

2. Obtain Architect's approval to replace luminaires with units of higher or lower wattage.

3. If mounting height is changed, revise aiming and recalculate and modify or replace support structures if indicated.

4. Retest as specified above after repairs, adjustments, or replacements are made.

5. Report results in writing.

F. Sports lighting will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

-- End of Section --

SECTION 31 00 00

EARTHWORK

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

AASHTO T 180 (2017) Standard Method of Test for
Moisture-Density Relations of Soils Using
a 4.54-kg (10-lb) Rammer and a 457-mm
(18-in.) Drop

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C600 (2017) Installation of Ductile-Iron Mains
and Their Appurtenances

ASTM INTERNATIONAL (ASTM)

ASTM C33/C33M (2018) Standard Specification for Concrete
Aggregates

ASTM C136/C136M (2019) Standard Test Method for Sieve
Analysis of Fine and Coarse Aggregates

ASTM D698 (2012; E 2014; E 2015) Laboratory
Compaction Characteristics of Soil Using
Standard Effort (12,400 ft-lbf/cu. ft.
(600 kN-m/cu. m.))

ASTM D1140 (2017) Standard Test Methods for
Determining the Amount of Material Finer
than 75- μ m (No. 200) Sieve in Soils by
Washing

ASTM D1556/D1556M (2015; E 2016) Standard Test Method for
Density and Unit Weight of Soil in Place
by Sand-Cone Method

ASTM D1557 (2012; E 2015) Standard Test Methods for
Laboratory Compaction Characteristics of
Soil Using Modified Effort (56,000
ft-lbf/ft³) (2700 kN-m/m³)

ASTM D2487 (2017; E 2020) Standard Practice for
Classification of Soils for Engineering
Purposes (Unified Soil Classification
System)

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ASTM D4318	(2017; E 2018) Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4718/D4718M	(2015) Standard Practice for Correction of Unit Weight and Water Content for Soils Containing Oversize Particles
ASTM D6938	(2017a) Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2014) Safety and Health Requirements Manual
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U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 600/4-79/020	(1983) Methods for Chemical Analysis of Water and Wastes
EPA SW-846.3-3	(1999, Third Edition, Update III-A) Test Methods for Evaluating Solid Waste: Physical/Chemical Methods

1.2 DEFINITIONS

1.2.1 Satisfactory Materials

Satisfactory materials comprise any materials classified by ASTM D2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, GM-GC, SW, SP, . Satisfactory materials for grading comprise stones less than 8 inches, except for fill material for pavements and railroads which comprise stones less than 3 inches in any dimension.

1.2.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include man-made fills; trash; refuse; backfills from previous construction; and material classified as satisfactory which contains root and other organic matter or frozen material. Notify the Contracting Officer when encountering any contaminated materials.

1.2.3 Cohesionless and Cohesive Materials

Cohesionless materials include materials classified in ASTM D2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic. Perform testing, required for classifying materials, in accordance with ASTM D4318, ASTM C136/C136M and ASTM D1140.

1.2.4 Degree of Compaction

Degree of compaction required, except as noted in the second sentence, is

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expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D1557 ASTM D698 abbreviated as a percent of laboratory maximum density. Since ASTM D1557 applies only to soils that have 30 percent or less by weight of their particles retained on the 3/4 inch sieve, express the degree of compaction for material having more than 30 percent by weight of their particles retained on the 3/4 inch sieve as a percentage of the maximum density in accordance with AASHTO T 180 and corrected with ASTM D4718/D4718M. To maintain the same percentage of coarse material, use the "remove and replace" procedure as described in NOTE 8 of Paragraph 7.2 in AASHTO T 180.

1.2.5 Topsoil

Material suitable for topsoils obtained from offsite areas is defined as: Natural, friable soil representative of productive, well-drained soils in the area, free of subsoil, stumps, rocks larger than one inch diameter, brush, weeds, toxic substances, and other material detrimental to plant growth. Amend topsoil pH range to obtain a pH of 5.5 to 7.

1.2.6 Rock

Solid homogeneous interlocking crystalline material with firmly cemented, laminated, or foliated masses or conglomerate deposits, neither of which can be removed without systematic drilling and blasting, drilling and the use of expansion jacks or feather wedges, or the use of backhoe-mounted pneumatic hole punchers or rock breakers; also large boulders, buried masonry, or concrete other than pavement exceeding [1/2] [_____] cubic yard in volume. Removal of hard material will not be considered rock excavation because of intermittent drilling and blasting that is performed merely to increase production.

1.2.7 Unstable Material

Unstable materials are too wet to properly support the utility pipe, conduit, or appurtenant structure.

1.2.8 Select Granular Material

1.2.8.1 General Requirements

Select granular material consist of materials classified as GW, GP, SW, or SP, by ASTM D2487 where indicated.

1.2.9 Initial Backfill Material

Initial backfill consists of select granular material or satisfactory materials free from rocks of such size as recommended by the pipe manufacturer, whichever is smaller.

1.2.10 Expansive Soils

1.3 SYSTEM DESCRIPTION

Subsurface soil boring logs are in the soil survey study prepare for this project and included in the contract documents. These data represent the best subsurface information available; however, variations may exist in the subsurface between boring locations.

Technical Specifications

1.3.1 Classification of Excavation

No consideration will be given to the nature of the materials, and all excavation will be designated as unclassified excavation.

1.3.1.1 Common Excavation

Include common excavation with the satisfactory removal and disposal of all materials not classified as rock excavation.

1.3.1.2 Rock Excavation

Submit notification of encountering rock in the project. Include rock excavation with blasting, excavating, grading, disposing of material classified as rock, and the satisfactory removal and disposal of boulders 1/2 cubic yard or more in volume; solid rock; rock material that is in ledges, bedded deposits, and unstratified masses, which cannot be removed without systematic drilling and blasting; firmly cemented conglomerate deposits possessing the characteristics of solid rock impossible to remove without systematic drilling and blasting; and hard materials (see Definitions). Include the removal of any concrete or masonry structures, except pavements, exceeding 1/2 cubic yard in volume that may be encountered in the work in this classification. If at any time during excavation, including excavation from borrow areas, the Contractor encounters material that may be classified as rock excavation, uncover such material and notify the Contracting Officer. Do not proceed with the excavation of this material until the Contracting Officer has classified the materials as common excavation or rock excavation and has taken cross sections as required. Failure on the part of the Contractor to uncover such material, notify the Contracting Officer, and allow ample time for classification and cross sectioning of the undisturbed surface of such material will cause the forfeiture of the Contractor's right of claim to any classification or volume of material to be paid for other than that allowed by the Contracting Officer for the areas of work in which such deposits occur.

1.3.2 Dewatering Work Plan

Submit procedures for accomplishing dewatering work.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-06 Test Reports

Testing

Borrow Site Testing

SD-07 Certificates

Testing

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PART 2 PRODUCTS

2.1 REQUIREMENTS FOR OFFSITE SOILS

Test offsite soils brought in for use as backfill for Total Petroleum Hydrocarbons (TPH), Benzene, Toluene, Ethyl Benzene, and Xylene (BTEX) and full Toxicity Characteristic Leaching Procedure (TCLP) including ignitability, corrosivity and reactivity. Backfill shall contain a maximum of 100 parts per million (ppm) of total petroleum hydrocarbons (TPH) and a maximum of 10 ppm of the sum of Benzene, Toluene, Ethyl Benzene, and Xylene (BTEX) and shall pass the TCPL test. Determine TPH concentrations by using EPA 600/4-79/020 Method 418.1. Determine BTEX concentrations by using EPA SW-846.3-3 Method 5030/8020. Perform TCLP in accordance with EPA SW-846.3-3 Method 1311. Provide Borrow Site Testing for TPH, BTEX and TCLP from a composite sample of material from the borrow site, with at least one test from each borrow site. Do not bring material onsite until tests have been approved by the Contracting Officer.

2.2 BURIED WARNING AND IDENTIFICATION TAPE

Provide polyethylene plastic and metallic core or metallic-faced, acid- and alkali-resistant, polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 3 inches minimum width, color coded as specified below for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Provide permanent color and printing, unaffected by moisture or soil.

Warning Tape Color Codes	
Red	Electric
Yellow	Gas, Oil; Dangerous Materials
Orange	Telephone and Other Communications
Blue	Water Systems
Green	Sewer Systems
White	Steam Systems
Gray	Compressed Air

2.2.1 Warning Tape for Metallic Piping

Provide acid and alkali-resistant polyethylene plastic tape conforming to the width, color, and printing requirements specified above, with a minimum thickness of 0.003 inch and a minimum strength of 1500 psi lengthwise, and 1250 psi crosswise, with a maximum 350 percent elongation.

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2.2.2 Detectable Warning Tape for Non-Metallic Piping

Provide polyethylene plastic tape conforming to the width, color, and printing requirements specified above, with a minimum thickness of 0.004 inch, and a minimum strength of 1500 psi lengthwise and 1250 psi crosswise. Manufacture tape with integral wires, foil backing, or other means of enabling detection by a metal detector when tape is buried up to 3 feet deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection.

2.3 DETECTION WIRE FOR NON-METALLIC PIPING

Insulate a single strand, solid copper detection wire with a minimum of 12 AWG.

2.4 CAPILLARY WATER BARRIER

Provide capillary water barrier of clean, poorly graded crushed rock, crushed gravel, or uncrushed gravel placed beneath a building slab with or without a vapor barrier to cut off the capillary flow of pore water to the area immediately below. Conform to ASTM C33/C33M for fine aggregate grading with a maximum of 3 percent by weight passing ASTM D1140, No. 200 sieve, or 1-1/2 inch and no more than 2 percent by weight passing the No. 4 size sieve or coarse aggregate Size 57, 67, or 77.

PART 3 EXECUTION

3.1 STRIPPING OF TOPSOIL

Where indicated or directed, strip topsoil to a depth of [4] [_____] inches. Spread topsoil on areas already graded and prepared for topsoil, or transported and deposited in stockpiles convenient to areas that are to receive application of the topsoil later, or at locations indicated or specified. Keep topsoil separate from other excavated materials, brush, litter, objectionable weeds, roots, stones larger than 2 inches in diameter, and other materials that would interfere with planting and maintenance operations. Remove from the site any surplus of topsoil from excavations and gradings.

3.2 GENERAL EXCAVATION

Perform excavation of every type of material encountered within the limits of the project to the lines, grades, and elevations indicated and as specified. Perform the grading in accordance with the typical sections shown and the tolerances specified in paragraph FINISHING. Transport satisfactory excavated materials and place in fill or embankment within the limits of the work. Excavate unsatisfactory materials encountered within the limits of the work below grade and replace with satisfactory materials as directed. Include such excavated material and the satisfactory material ordered as replacement in excavation. Dispose surplus satisfactory excavated material not required for fill and unsatisfactory excavated material as specified in paragraph DISPOSITION OF SURPLUS MATERIAL. During construction, perform excavation and fill in a manner and sequence that will provide proper drainage at all times. Excavate material required for fill or embankment in excess of that produced by excavation within the grading limits from other approved areas selected by the Contractor as specified.

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3.2.1 Ditches, Gutters, and Channel Changes

Finish excavation of ditches, gutters, and channel changes by cutting accurately to the cross sections, grades, and elevations shown on Drawings . Do not excavate ditches and gutters below grades shown. Backfill the excessive open ditch or gutter excavation with satisfactory, thoroughly compacted, material or with suitable stone or cobble to grades shown. Dispose excavated material as shown or as directed, except in no case allow material be deposited a maximum 4 feet from edge of a ditch. Maintain excavations free from detrimental quantities of leaves, brush, sticks, trash, and other debris until final acceptance of the work.

3.2.2 Drainage Structures

Make excavations to the lines, grades, and elevations shown, or as directed. Provide trenches and foundation pits of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown. Clean rock or other hard foundation material of loose debris and cut to a firm, level, stepped, or serrated surface. Remove loose disintegrated rock and thin strata. Do not disturb the bottom of the excavation when concrete or masonry is to be placed in an excavated area. Do not excavate to the final grade level until just before the concrete or masonry is to be placed. Where pile foundations are to be used, stop the excavation of each pit at an elevation 1 foot above the base of the footing, as specified, before piles are driven. After the pile driving has been completed, remove loose and displaced material and complete excavation, leaving a smooth, solid, undisturbed surface to receive the concrete or masonry.

3.2.3 Drainage

Provide for the collection and disposal of surface and subsurface water encountered during construction. Completely drain construction site during periods of construction to keep soil materials sufficiently dry. Construct storm drainage features (ponds/basins) at the earliest stages of site development, and throughout construction grade the construction area to provide positive surface water runoff away from the construction activity and provide temporary ditches, swales, and other drainage features and equipment as required to maintain dry soils. When unsuitable working platforms for equipment operation and unsuitable soil support for subsequent construction features develop, remove unsuitable material and provide new soil material as specified herein. It is the responsibility of the Contractor to assess the soil and ground water conditions presented by the plans and specifications and to employ necessary measures to permit construction to proceed.

3.2.4 Dewatering

Control groundwater flowing toward or into excavations to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. Do not permit French drains, sumps, ditches or trenches within 3 feet of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Take control measures by the time the excavation reaches the water level in order to maintain the integrity of the in situ material. While the excavation is open, maintain the water level continuously, at least 0.30 feet below the working level. Operate dewatering system continuously until construction

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work below existing water levels is complete. Submit performance records weekly.

3.2.5 Trench Excavation Requirements

Excavate the trench as recommended by the manufacturer of the pipe to be installed. Slope trench walls below the top of the pipe, or make vertical, and of such width as recommended in the manufacturer's printed installation manual. Provide vertical trench walls where no manufacturer's printed installation manual is available. Shore trench walls, cut back to a stable slope, or provide with equivalent means of protection for employees who may be exposed to moving ground or cave in, as determined by the Contractor's Safety Engineer or other competent person; refer to USACE publication EM 385-1-1. Excavate trench walls which are cut back to at least the angle of repose of the soil. Give special attention to slopes which may be adversely affected by weather or moisture content. Do not exceed the trench width below the pipe top of 24 inches plus pipe outside diameter (O.D.) for pipes of less than 24 inches inside diameter, and do not exceed 36 inches plus pipe outside diameter for sizes larger than 24 inches inside diameter. Where recommended trench widths are exceeded, provide redesign, stronger pipe, or special installation procedures by the Contractor. The Contractor is responsible for the cost of redesign, stronger pipe, or special installation procedures without any additional cost to the Government.

3.2.5.1 Bottom Preparation

Grade the bottoms of trenches accurately to provide uniform bearing and support for the bottom quadrant of each section of the pipe. Excavate bell holes to the necessary size at each joint or coupling to eliminate point bearing. Remove stones of 75 inch or greater in any dimension, or as recommended by the pipe manufacturer, whichever is smaller, to avoid point bearing.

3.2.5.2 Removal of Unyielding Material

Where overdepth is not indicated and unyielding material is encountered in the bottom of the trench, remove such material 100 inch below the required grade and replaced with suitable materials as provided in paragraph BACKFILLING AND COMPACTION.

3.2.5.3 Removal of Unstable Material

Where unstable material is encountered in the bottom of the trench, remove such material to the depth directed and replace it to the proper grade with select granular material as provided in paragraph BACKFILLING AND COMPACTION. When removal of unstable material is required due to the Contractor's fault or neglect in performing the work, the Contractor is responsible for excavating the resulting material and replacing it without additional cost to the Government.

3.2.5.4 Excavation for Appurtenances

Provide excavation for manholes, catch-basins, inlets, or similar structures sufficient to leave at least 12 inches clear between the outer structure surfaces and the face of the excavation or support members. Clean rock or loose debris and cut to a firm surface either level, stepped, or serrated, as shown or as directed. Remove loose disintegrated rock and thin strata. Specify removal of unstable material. When

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concrete or masonry is to be placed in an excavated area, take special care not to disturb the bottom of the excavation. Do not excavate to the final grade level until just before the concrete or masonry is to be placed.

3.2.6 Underground Utilities

The Contractor is responsible for movement of construction machinery and equipment over pipes and utilities during construction. Report damage to utility lines or subsurface construction immediately to the Contracting Officer.

3.2.7 Structural Excavation

Ensure that footing subgrades have been inspected and approved by the Contracting Officer prior to concrete placement. Excavate to bottom of pile cap prior to placing or driving piles, unless authorized otherwise by the Contracting Officer. Backfill and compact over excavations and changes in grade due to pile driving operations to 95 percent of ASTM D698 maximum density.

3.3 OPENING AND DRAINAGE OF EXCAVATION

Notify the Contracting Officer sufficiently in advance of the opening of any excavation or borrow pit to permit elevations and measurements of the undisturbed ground surface to be taken. Except as otherwise permitted, excavation areas providing adequate drainage. Transport overburden and other spoil material to designated spoil areas or otherwise dispose of as directed. Provide neatly trimmed and drained borrow pits after the excavation is completed. Ensure that excavation of any area, operation of borrow pits, or dumping of spoil material results in minimum detrimental effects on natural environmental conditions.

3.4 SHORING

3.4.1 General Requirements

Submit a Shoring and Sheet piling plan for approval 15 days prior to starting work. Submit drawings and calculations, certified by a registered professional engineer, describing the methods for shoring and sheet piling of excavations. Finish shoring, including sheet piling, and install as necessary to protect workmen, banks, adjacent paving, structures, and utilities. Remove shoring, bracing, and sheet piling as excavations are backfilled, in a manner to prevent caving.

3.4.2 Geotechnical Engineer

Hire a Professional Geotechnical Engineer to provide inspection of excavations and soil/groundwater conditions throughout construction. The Geotechnical Engineer is responsible for performing pre-construction and periodic site visits throughout construction to assess site conditions. The Geotechnical Engineer is responsible for updating the excavation, sheet piling and dewatering plans as construction progresses to reflect changing conditions and submit an updated plan if necessary. Submit a monthly written report, informing the Contractor and Contracting Officer of the status of the plan and an accounting of the Contractor's adherence to the plan addressing any present or potential problems. The Contracting Officer is responsible for arranging meetings with the Geotechnical Engineer at any time throughout the contract duration.

3.5 GRADING AREAS

Where indicated, divide work into grading areas within which satisfactory excavated material will be placed in embankments, fills, and required backfills. Do not haul satisfactory material excavated in one grading area to another grading area except when so directed in writing. Place and grade stockpiles of satisfactory and wasted materials as specified. Keep stockpiles in a neat and well drained condition, giving due consideration to drainage at all times. Clear, grub, and seal by rubber-tired equipment, the ground surface at stockpile locations; separately stockpile excavated satisfactory and unsatisfactory materials. Protect stockpiles of satisfactory materials from contamination which may destroy the quality and fitness of the stockpiled material. If the Contractor fails to protect the stockpiles, and any material becomes unsatisfactory, remove and replace such material with satisfactory material from approved sources.

3.6 FINAL GRADE OF SURFACES TO SUPPORT CONCRETE

Do not excavate to final grade until just before concrete is to be placed. Only use excavation methods that will leave the foundation rock in a solid and unshattered condition. Roughen the level surfaces, and cut the sloped surfaces, as indicated, into rough steps or benches to provide a satisfactory bond. Protect shales from slaking and all surfaces from erosion resulting from ponding or water flow.

3.7 GROUND SURFACE PREPARATION

3.7.1 General Requirements

Remove and replace unsatisfactory material with satisfactory materials, as directed by the Contracting Officer, in surfaces to receive fill or in excavated areas. Scarify the surface to a depth of 6 inches before the fill is started. Plow, step, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so that the fill material will bond with the existing material. When subgrades are less than the specified density, break up the ground surface to a minimum depth of 6 inches, pulverizing, and compacting to the specified density. When the subgrade is part fill and part excavation or natural ground, scarify the excavated or natural ground portion to a depth of 12 inches and compact it as specified for the adjacent fill.

3.8 UTILIZATION OF EXCAVATED MATERIALS

Use satisfactory material removed from excavations, insofar as practicable, in the construction of fills, embankments, subgrades, shoulders, bedding (as backfill), and for similar purposes. Dispose surplus satisfactory excavated material not required for fill and unsatisfactory excavated material as specified in paragraph DISPOSITION OF SURPLUS MATERIAL. Stockpile and use coarse rock from excavations for constructing slopes or embankments adjacent to streams, or sides and bottoms of channels and for protecting against erosion. Do not dispose excavated material to obstruct the flow of any stream, endanger a partly finished structure, impair the efficiency or appearance of any structure, or be detrimental to the completed work in any way.

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3.9 BURIED TAPE AND DETECTION WIRE

3.9.1 Buried Warning and Identification Tape

Provide buried utility lines with utility identification tape. Bury tape 12 inches below finished grade; under pavements and slabs, bury tape 6 inches below top of subgrade.

3.9.2 Buried Detection Wire

Bury detection wire directly above non-metallic piping at a distance not to exceed 12 inches above the top of pipe. Extend the wire continuously and unbroken, from manhole to manhole. Terminate the ends of the wire inside the manholes at each end of the pipe, with a minimum of 3 feet of wire, coiled, remaining accessible in each manhole. Furnish insulated wire over its entire length. Install wires at manholes between the top of the corbel and the frame, and extend up through the chimney seal between the frame and the chimney seal. For force mains, terminate the wire in the valve pit at the pump station end of the pipe.

3.10 FILLING, BACKFILLING AND COMPACTION

Place fill and backfill beneath and adjacent to any and all type of structures, in successive horizontal layers of loose material not more than 8 inches in depth, or in loose layers not more than 5 inches in depth when using hand-operated compaction equipment. Compact to at least 90 percent of laboratory maximum density for cohesive materials or 95 percent of laboratory maximum density for cohesionless materials, except as otherwise specified. Perform compaction in such a manner as to prevent wedging action or eccentric loading upon or against the structure. Moisture condition fill and backfill material to a moisture content that will readily facilitate obtaining the specified compaction.

Prepare ground surface on which backfill is to be placed and provide compaction requirements for backfill materials in conformance with the applicable portions of paragraphs GROUND SURFACE PREPARATION. Finish compaction by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.10.1 Trench Backfill

Backfill trenches to the grade shown. Do not backfill the trench until all specified tests are performed.

3.10.1.1 Replacement of Unyielding Material

Replace unyielding material removed from the bottom of the trench with select granular material or initial backfill material.

3.10.1.2 Replacement of Unstable Material

Replace unstable material removed from the bottom of the trench or excavation with select granular material placed in layers not exceeding 6 inches loose thickness.

3.10.1.3 Bedding and Initial Backfill

Provide bedding of the type and thickness shown. Place initial backfill material and compact it with approved tampers to a height of at least one

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foot above the utility pipe or conduit. Bring up the backfill evenly on both sides of the pipe for the full length of the pipe. Take care to ensure thorough compaction of the fill under the haunches of the pipe. Except as specified otherwise in the individual piping section, provide bedding for buried piping in accordance with AWWA C600, Type 4, except as specified herein. Compact backfill to top of pipe to 95 percent of ASTM D698 maximum density. Provide plastic piping with bedding to spring line of pipe. Provide materials as follows:

3.10.1.3.1 Class I

Angular, 0.25 to 1.5 inch, graded stone, including a number of fill materials that have regional significance such as coral, slag, cinders, crushed stone, and crushed shells.

3.10.1.3.2 Class II

Coarse sands and gravels with maximum particle size of 1.5 inch, including various graded sands and gravels containing small percentages of fines, generally granular and noncohesive, either wet or dry. Soil Types GW, GP, SW, and SP are included in this class as specified in ASTM D2487.

3.10.1.3.3 Sand

Clean, coarse-grained sand classified as SW or SP.

3.10.1.3.4 Gravel and Crushed Stone

Clean, coarsely graded natural gravel, crushed stone or a combination thereof identified as GW or GP.

3.10.1.4 Final Backfill

Fill the remainder of the trench, except for special materials for roadways, railroads and airfields, with satisfactory material. Place backfill material and compact as follows:

3.10.1.4.1 Roadways, Railroads, and Airfields

Place backfill up to the required elevation as specified. Do not permit water flooding or jetting methods of compaction.

3.10.1.4.2 Sidewalks, Turfed or Seeded Areas and Miscellaneous Areas

Deposit backfill in layers of a maximum of 12 inches loose thickness, and compact it to 85 percent maximum density for cohesive soils and 90 percent maximum density for cohesionless soils. Do not permit compaction by water flooding or jetting. Apply this requirement to all other areas not specifically designated above.

3.10.2 Backfill for Appurtenances

After the manhole, catchbasin, inlet, or similar structure has been constructed and the concrete has been allowed to cure for 3 days, place backfill in such a manner that the structure is not be damaged by the shock of falling earth. Deposit the backfill material, compact it as specified for final backfill, and bring up the backfill evenly on all sides of the structure to prevent eccentric loading and excessive stress.

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3.11 SPECIAL REQUIREMENTS

Special requirements for both excavation and backfill relating to the specific utilities are as follows:

3.11.1 Electrical Distribution System

Provide a minimum cover of 24 inches from the finished grade to direct burial cable and conduit or duct line, unless otherwise indicated.

3.12 FINISHING

Finish the surface of excavations, embankments, and subgrades to a smooth and compact surface in accordance with the lines, grades, and cross sections or elevations shown. Provide the degree of finish for graded areas within 0.1 foot of the grades and elevations indicated except that the degree of finish for subgrades specified in paragraph SUBGRADE PREPARATION. Finish gutters and ditches in a manner that will result in effective drainage. Finish the surface of areas to be turfed from settlement or washing to a smoothness suitable for the application of turfing materials. Repair graded, topsoiled, or backfilled areas prior to acceptance of the work, and re-established grades to the required elevations and slopes.

3.12.1 Subgrade and Embankments

During construction, keep embankments and excavations shaped and drained. Maintain ditches and drains along subgrade to drain effectively at all times. Do not disturb the finished subgrade by traffic or other operation. Protect and maintain the finished subgrade in a satisfactory condition until ballast, subbase, base, or pavement is placed. Do not permit the storage or stockpiling of materials on the finished subgrade. Do not lay subbase, base course, ballast, or pavement until the subgrade has been checked and approved, and in no case place subbase, base, surfacing, pavement, or ballast on a muddy, spongy, or frozen subgrade.

3.12.2 Capillary Water Barrier

Place a capillary water barrier under concrete floor and area-way slabs grade directly on the subgrade and compact with a minimum of two passes of a hand-operated plate-type vibratory compactor.

3.12.3 Grading Around Structures

Construct areas within 5 feet outside of each building and structure line true-to-grade, shape to drain, and maintain free of trash and debris until final inspection has been completed and the work has been accepted.

3.13 PLACING TOPSOIL

On areas to receive topsoil, prepare the compacted subgrade soil to a 2 inches depth for bonding of topsoil with subsoil. Spread topsoil evenly to a thickness of 100 inch and grade to the elevations and slopes shown. Do not spread topsoil when frozen or excessively wet or dry. Obtain material required for topsoil in excess of that produced by excavation within the grading limits from areas indicated.

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3.14 TESTING

Perform testing by a Corps validated commercial testing laboratory or the Contractor's validated testing facility. Submit qualifications of the Corps validated commercial testing laboratory or the Contractor's validated testing facilities. If the Contractor elects to establish testing facilities, do not permit work requiring testing until the Contractor's facilities have been inspected, Corps validated and approved by the Contracting Officer.

- a. Determine field in-place density in accordance with ASTM D1556/D1556M .
When test results indicate, as determined by the Contracting Officer, that compaction is not as specified, remove the material, replace and recompact to meet specification requirements.
- c. Perform tests on recompacted areas to determine conformance with specification requirements. Appoint a registered professional civil engineer to certify inspections and test results. These certifications shall state that the tests and observations were performed by or under the direct supervision of the engineer and that the results are representative of the materials or conditions being certified by the tests. The following number of tests, if performed at the appropriate time, will be the minimum acceptable for each type operation.

3.14.1 Fill and Backfill Material Gradation

One test per 180 cubic yards stockpiled or in-place source material. Determine gradation of fill and backfill material in accordance with ASTM C136/C136M .

3.14.2 In-Place Densities

- a. One test per 100 square feet, or fraction thereof, of each lift of fill or backfill areas compacted by other than hand-operated machines.

3.14.3 Check Tests on In-Place Densities

If ASTM D6938 is used, check in-place densities by ASTM D1556/D1556M as follows:

- a. One check test per lift for each 100 square feet, or fraction thereof, of each lift of fill or backfill compacted by other than hand-operated machines.
- b. One check test per lift for each 20 square feet, of fill or backfill areas compacted by hand-operated machines.
- c. One check test per lift for each 50 linear feet, or fraction thereof, of embankment or backfill for roads .

3.14.4 Moisture Contents

In the stockpile, excavation, or borrow areas, perform a minimum of two tests per day per type of material or source of material being placed during stable weather conditions. During unstable weather, perform tests as dictated by local conditions and approved by the Contracting Officer.

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3.14.5 Optimum Moisture and Laboratory Maximum Density

Perform tests for each type material or source of material including borrow material to determine the optimum moisture and laboratory maximum density values. One representative test per 180 cubic yards of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density.

3.14.6 Tolerance Tests for Subgrades

Perform continuous checks on the degree of finish specified in paragraph SUBGRADE PREPARATION during construction of the subgrades.

3.14.7 Displacement of Sewers

After other required tests have been performed and the trench backfill compacted to 0.30, feet above the top of the pipe , inspect the pipe to determine whether significant displacement has occurred. Conduct this inspection in the presence of the Contracting Officer. Inspect pipe sizes larger than 36 inches, while inspecting smaller diameter pipe by shining a light or laser between manholes or manhole locations, or by the use of television cameras passed through the pipe. If, in the judgment of the Contracting Officer, the interior of the pipe shows poor alignment or any other defects that would cause improper functioning of the system, replace or repair the defects as directed at no additional cost to the Government.

3.15 DISPOSITION OF SURPLUS MATERIAL

Surplus material and excavated unsatisfactory material not required or suitable for filling or backfilling, and brush, refuse, stumps, roots, and timber shall be removed from Government property and properly disposed of in accordance with all applicable laws and regulations.

-- End of Section --

SECTION 32 16 19

CONCRETE CURBS, GUTTERS AND SIDEWALKS

PART 1 GENERAL

1.1 UNIT PRICES

1.1.1 Measurement

1.1.1.1 Sidewalks

The quantities of sidewalks to be paid for will be the number of square yards of each depth of sidewalk constructed as indicated.

1.1.1.2 Curbs and Gutters

The quantities of curbs and gutters to be paid for will be the number of linear feet of each cross section constructed as indicated, measured along the face of the curb at the gutter line.

1.1.2 Payment

1.1.2.1 Sidewalks

Payment of the quantities of sidewalks measured as specified will be at the Contract unit price per square yard of the thickness specified.

1.1.2.2 Curbs and Gutters

Payment of the quantities of curbs and gutters measured as specified will be at the Contract unit price per linear foot of each cross section.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

AASHTO M 182 (2005; R 2017) Standard Specification for
Burlap Cloth Made from Jute or Kenaf and
Cotton Mats

ASTM INTERNATIONAL (ASTM)

ASTM A615/A615M (2020) Standard Specification for Deformed
and Plain Carbon-Steel Bars for Concrete
Reinforcement

ASTM A1064/A1064M (2017) Standard Specification for
Carbon-Steel Wire and Welded Wire
Reinforcement, Plain and Deformed, for
Concrete

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ASTM C31/C31M	(2019a) Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C143/C143M	(2020) Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C171	(2020) Standard Specification for Sheet Materials for Curing Concrete
ASTM C172/C172M	(2017) Standard Practice for Sampling Freshly Mixed Concrete
ASTM C173/C173M	(2016) Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C231/C231M	(2017a) Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C309	(2011) Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM D1751	(2004; E 2013; R 2013) Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D1752	(2018) Standard Specification for Preformed Sponge Rubber, Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D5893/D5893M	(2016) Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements

INTERNATIONAL CODE COUNCIL (ICC)

ICC A117.1 COMM	(2017) Standard And Commentary Accessible and Usable Buildings and Facilities
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1.3 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Technical Specifications

Concrete

Biodegradable Form Release Agent]

SD-06 Test Reports

Field Quality Control

1.4 EQUIPMENT, TOOLS, AND MACHINES

1.4.1 General Requirements

Plant, equipment, machines, and tools used in the work will be subject to approval and must be maintained in a satisfactory working condition at all times. Use equipment capable of producing the required product, meeting grade controls, thickness control and smoothness requirements as specified. Discontinue using equipment that produces unsatisfactory results. Allow the Contracting Officer access at all times to the plant and equipment to ensure proper operation and compliance with specifications.

1.4.2 Slip Form Equipment

Slip form paver or curb forming machines, will be approved based on trial use on the job and must be self-propelled, automatically controlled, crawler mounted, and capable of spreading, consolidating, and shaping the plastic concrete to the desired cross section in one pass.

1.5 ENVIRONMENTAL REQUIREMENTS

1.5.1 Placing During Warm Weather

The temperature of the concrete as placed must not exceed 85 degrees F except where an approved retarder is used. Cool the mixing water and aggregates as necessary to maintain a satisfactory placing temperature. The placing temperature must not exceed 95 degrees F at any time.

PART 2 PRODUCTS

2.1 CONCRETE

Provide concrete conforming to the applicable requirements of Section 03 30 00 CAST-IN-PLACE CONCRETE except as otherwise specified. Concrete must have a minimum compressive strength of 3500 psi at 28 days. Size of aggregate must not exceed 1-1/2 inches. Submit copies of certified delivery tickets for all concrete used in the construction.

2.1.1 Air Content

Use concrete mixtures that have an air content by volume of concrete of 5 to 7 percent, based on measurements made immediately after discharge from the mixer.

2.1.2 Slump

Use concrete with a slump of 3 inches plus or minus 1 inch for hand placed concrete or 1 inch plus or minus 1/2 inch for slipformed concrete as determined in accordance with ASTM C143/C143M.

Technical Specifications

2.1.3 Reinforcement Steel

Use reinforcement bars conforming to ASTM A615/A615M. Use wire mesh reinforcement conforming to ASTM A1064/A1064M.

2.2 CONCRETE CURING MATERIALS

2.2.1 Impervious Sheet Materials

Use impervious sheet materials conforming to ASTM C171, type optional, except that polyethylene film, if used, must be white opaque.

2.2.2 Burlap

Use burlap conforming to AASHTO M 182.

2.2.3 White Pigmented Membrane-Forming Curing Compound

Use white pigmented membrane-forming curing compound conforming to ASTM C309, Type 2.

2.3 CONCRETE PROTECTION MATERIALS

Use concrete protection materials consisting of a linseed oil mixture of equal parts, by volume, of linseed oil and either mineral spirits, naphtha, or turpentine. At the option of the Contractor, commercially prepared linseed oil mixtures, formulated specifically for application to concrete to provide protection against the action of deicing chemicals may be used, except that emulsified mixtures are not acceptable.

2.4 JOINT FILLER STRIPS

2.4.1 Contraction Joint Filler for Curb and Gutter

Use hard-pressed fiberboard contraction joint filler for curb and gutter.

2.4.2 Expansion Joint Filler, Premolded

Unless otherwise indicated, use 1/2 inch thick premolded expansion joint filler conforming to ASTM D1751 or ASTM D1752.

2.5 JOINT SEALANTS

Use cold-applied joint sealant conforming to ASTM C920 or ASTM D5893/D5893M.

2.6 FORM WORK

Design and construct form work to ensure that the finished concrete will conform accurately to the indicated dimensions, lines, and elevations, and within the tolerances specified. Use wood or steel forms that are straight and of sufficient strength to resist springing during depositing and consolidating concrete.

2.6.1 Wood Forms

Use forms that are surfaced plank, 2 inches nominal thickness, straight and free from warp, twist, loose knots, splits or other defects. Use forms with a nominal length of 10 feet. Radius bends may be formed with

Technical Specifications

3/4 inch boards, laminated to the required thickness.

2.6.2 Steel Forms

Use channel-formed sections with a flat top surface and welded braces at each end and at not less than two intermediate points. Use forms with interlocking and self-aligning ends. Provide flexible forms for radius forming, corner forms, form spreaders, and fillers as needed. Use forms with a nominal length of 10 feet and that have a minimum of 3 welded stake pockets per form. Use stake pins consisting of solid steel rods with chamfered heads and pointed tips designed for use with steel forms.

2.6.3 Sidewalk Forms

Use sidewalk forms that are of a height equal to the full depth of the finished sidewalk.

2.6.4 Curb and Gutter Forms

Use curb and gutter outside forms that have a height equal to the full depth of the curb or gutter. Use rigid forms for curb returns, except that benders or thin plank forms may be used for curb or curb returns with a radius of 10 feet or more, where grade changes occur in the return, or where the central angle is such that a rigid form with a central angle of 90 degrees cannot be used. Back forms for curb returns may be made of 1-1/2 inch benders, for the full height of the curb, cleated together. In lieu of inside forms for curbs, a curb "mule" may be used for forming and finishing this surface, provided the results are approved.

2.6.5 Biodegradable Form Release Agent

Use form release agent that is colorless and biodegradable and that is composed of at least 87 percent biobased material. Provide product that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces. Provide form release agent that does not contain diesel fuel, petroleum-based lubricating oils, waxes, or kerosene.

2.7 Detectable Warning System

Detectable Warning Systems shown on the Contract plans are to meet requirements of ICC A117.1 COMM - Section 705.

PART 3 EXECUTION

3.1 SUBGRADE PREPARATION

Construct subgrade to the specified grade and cross section prior to concrete placement.

3.1.1 Sidewalk Subgrade

Place and compact the subgrade in accordance with Section 31 00 00 EARTHWORK. Test the subgrade for grade and cross section with a template extending the full width of the sidewalk and supported between side forms.

3.1.2 Curb and Gutter Subgrade

Place and compact the subgrade in accordance with Section 31 00 00

Technical Specifications

EARTHWORK . Test the subgrade for grade and cross section by means of a template extending the full width of the curb and gutter. Use subgrade materials equal in bearing quality to the subgrade under the adjacent pavement.

3.1.3 Maintenance of Subgrade

Maintain subgrade in a smooth, compacted condition in conformity with the required section and established grade until the concrete is placed. The subgrade must be in a moist condition when concrete is placed. Prepare and protect subgrade so that it is free from frost when the concrete is deposited.

3.2 FORM SETTING

Set forms to the indicated alignment, grade and dimensions. Hold forms rigidly in place by a minimum of 3 stakes per form placed at intervals not to exceed 4 feet. Use additional stakes and braces at corners, deep sections, and radius bends, as required. Use clamps, spreaders, and braces where required to ensure rigidity in the forms. Remove forms in a manner that will not injure the concrete. Do not use bars or heavy tools against the concrete when removing the forms. Promptly and satisfactorily repair concrete found to be defective after form removal. Clean forms and coat with form oil or biodegradable form release agent each time before concrete is placed. Wood forms may, instead, be thoroughly wetted with water before concrete is placed, except that with probable freezing temperatures, oiling is mandatory.

3.2.1 Sidewalks

Set forms for sidewalks with the upper edge true to line and grade with an allowable tolerance of 1/8 inch in any 10 foot long section. After forms are set, grade and alignment must be checked with a 10 foot straightedge. Sidewalks must have a transverse slope of 1/4 inch per foot. Do not remove side forms less than 12 hours after finishing has been completed.

3.2.2 Curbs and Gutters

Remove forms used along the front of the curb not less than 2 hours nor more than 6 hours after the concrete has been placed. Do not remove forms used along the back of curb until the face and top of the curb have been finished, as specified for concrete finishing. Do not remove gutter forms while the concrete is sufficiently plastic to slump in any direction.

3.3 SIDEWALK CONCRETE PLACEMENT AND FINISHING

3.3.1 Formed Sidewalks

Place concrete in the forms in one layer. When consolidated and finished, the sidewalks must be of the thickness indicated. Use a strike-off guided by side forms after concrete has been placed in the forms to bring the surface to proper section to be compacted. Consolidate concrete by tamping and spading or with an approved vibrator. Finish the surface to grade with a strike off.

3.3.2 Concrete Finishing

After straightedging, when most of the water sheen has disappeared, and just before the concrete hardens, finish the surface with a wood or

Technical Specifications

magnesium float or darby to a smooth and uniformly fine granular or sandy texture free of waves, irregularities, or tool marks. Produce a scored surface by brooming with a fiber-bristle brush in a direction transverse to that of the traffic, followed by edging.

3.3.3 Edge and Joint Finishing

Finish all slab edges, including those at formed joints, with an edger having a radius of 1/8 inch. Edge transverse joints before brooming. Eliminate the flat surface left by the surface face of the edger with brooming. Clean and solidly fill corners and edges which have crumbled and areas which lack sufficient mortar for proper finishing with a properly proportioned mortar mixture and then finish.

3.3.4 Surface and Thickness Tolerances

Finished surfaces must not vary more than 5/16 inch from the testing edge of a 10-foot straightedge. Permissible deficiency in section thickness will be up to 1/4 inch.

3.4 CURB AND GUTTER CONCRETE PLACEMENT AND FINISHING

3.4.1 Formed Curb and Gutter

Place concrete to the required section in a single lift. Consolidate concrete using approved mechanical vibrators. Curve shaped gutters must be finished with a standard curb "mule".

3.4.2 Curb and Gutter Finishing

Approved slipformed curb and gutter machines may be used in lieu of hand placement.

3.4.3 Concrete Finishing

Float and finish exposed surfaces with a smooth wood float until true to grade and section and uniform in texture. Brush floated surfaces with a fine-hair brush using longitudinal strokes. Round the edges of the gutter and top of the curb with an edging tool to a radius of 1/2 inch. Immediately after removing the front curb form, rub the face of the curb with a wood or concrete rubbing block and water until blemishes, form marks, and tool marks have been removed. Brush the front curb surface, while still wet, in the same manner as the gutter and curb top. Finish the top surface of gutter and entrance to grade with a wood float.

3.4.4 Joint Finishing

Finish curb edges at formed joints as indicated.

3.4.5 Surface and Thickness Tolerances

Finished surfaces must not vary more than 1/4 inch from the testing edge of a 10-foot straightedge. Permissible deficiency in section thickness will be up to 1/4 inch.

3.5 SIDEWALK JOINTS

Construct sidewalk joints to divide the surface into rectangular areas. Space transverse contraction joints at a distance equal to the sidewalk

Technical Specifications

width or 5 feet on centers, whichever is less, and continuous across the slab. Construct longitudinal contraction joints along the centerline of all sidewalks 10 feet or more in width. Construct transverse expansion joints at sidewalk returns and opposite expansion joints in adjoining curbs. Where the sidewalk is not in contact with the curb, install transverse expansion joints as indicated. Form expansion joints around structures and features which project through or into the sidewalk pavement, using joint filler of the type, thickness, and width indicated. Expansion joints are not required between sidewalks and curb that abut the sidewalk longitudinally.

3.5.1 Sidewalk Contraction Joints

Form contraction joints in the fresh concrete by cutting a groove in the top portion of the slab to a depth of at least one-fourth of the sidewalk slab thickness. Unless otherwise approved or indicated, either use a jointer to cut the groove or saw a groove in the hardened concrete with a power-driven saw. Construct sawed joints by sawing a groove in the concrete with a 1/8 inch blade. Provide an ample supply of saw blades on the jobsite before concrete placement is started. Provide at least one standby sawing unit in good working order at the jobsite at all times during the sawing operations.

3.5.2 Sidewalk Expansion Joints

Form expansion joints using 1/2 inch joint filler strips. Joint filler in expansion joints surrounding structures and features within the sidewalk may consist of preformed filler material conforming to ASTM D1752 or building paper. Hold joint filler in place with steel pins or other devices to prevent warping of the filler during floating and finishing. Immediately after finishing operations are completed, round joint edges using an edging tool having a radius of 1/8 inch. Remove any concrete over the joint filler. At the end of the curing period, clean the top of expansion joints and fill with cold-applied joint sealant. Use joint sealant that is gray or stone in color. Thoroughly clean the joint opening before the sealing material is placed. Do not spill sealing material on exposed surfaces of the concrete. Apply joint sealing material only when the concrete at the joint is surface dry and atmospheric and concrete temperatures are above 50 degrees F. Immediately remove any excess material on exposed surfaces of the concrete and clean the concrete surfaces.

3.5.3 Reinforcement Steel Placement

Accurately and securely fasten reinforcement steel in place with suitable supports and ties before the concrete is placed.

3.6 CURB AND GUTTER JOINTS

Construct curb and gutter joints at right angles to the line of curb and gutter.

3.6.1 Contraction Joints

Construct contraction joints directly opposite contraction joints in abutting portland cement concrete pavements and spaced so that monolithic sections between curb returns will not be less than 5 feet nor greater than 15 feet in length.

Technical Specifications

- a. Construct contraction joints (except for slip forming) by means of 1/8 inch thick separators and of a section conforming to the cross section of the curb and gutter. Remove separators as soon as practicable after concrete has set sufficiently to preserve the width and shape of the joint and prior to finishing.
- b. When slip forming is used, cut the contraction joints in the top portion of the gutter/curb hardened concrete in a continuous cut across the curb and gutter, using a power-driven saw. Cut the contraction joint to a depth of at least one-fourth of the gutter/curb depth using a 1/8 inch saw blade.

3.6.2 Expansion Joints

Form expansion joints by means of preformed expansion joint filler material cut and shaped to the cross section of curb and gutter. Construct expansion joints in curb and gutter directly opposite expansion joints of abutting portland cement concrete pavement using the same type and thickness of joints as joints in the pavement. Where curb and gutter do not abut portland cement concrete pavement, provide expansion joints at least 1/2 inch in width at intervals not less than 30 feet nor greater than 120 feet. Seal expansion joints immediately following curing of the concrete or as soon thereafter as weather conditions permit. Seal expansion joints and the top 1 inch depth of curb and gutter contraction-joints with joint sealant. Thoroughly clean the joint opening before the sealing material is placed. Do not spill sealing material on exposed surfaces of the concrete. Concrete at the joint must be surface dry and atmospheric and concrete temperatures must be above 50 degrees F at the time of application of joint sealing material. Immediately remove excess material on exposed surfaces of the concrete and clean concrete surfaces.

3.7 CURING AND PROTECTION

3.7.1 General Requirements

Protect concrete against loss of moisture and rapid temperature changes for at least 7 days from the beginning of the curing operation. Protect unhardened concrete from rain and flowing water. All equipment needed for adequate curing and protection of the concrete must be on hand and ready for use before actual concrete placement begins. Protect concrete as necessary to prevent cracking of the pavement due to temperature changes during the curing period.

3.7.1.1 Mat Method

Cover the entire exposed surface with two or more layers of burlap. Overlap mats at least 6 inches. Thoroughly wet the mat with water prior to placing on concrete surface and keep the mat continuously in a saturated condition and in intimate contact with concrete for not less than 7 days.

3.7.1.2 Impervious Sheeting Method

Wet the entire exposed surface with a fine spray of water and then cover with impervious sheeting material. Lay sheets directly on the concrete surface with the light-colored side up and overlapped 12 inches when a continuous sheet is not used. Use sheeting that is not less than 18-inches wider than the concrete surface to be cured. Secure sheeting using heavy

Technical Specifications

wood planks or a bank of moist earth placed along edges and laps in the sheets. Satisfactorily repair or replace sheets that are torn or otherwise damaged during curing. Sheeting must remain on the concrete surface to be cured for not less than 7 days.

3.7.1.3 Membrane Curing Method

Apply a uniform coating of white-pigmented membrane-curing compound to the entire exposed surface of the concrete as soon after finishing as the free water has disappeared from the finished surface. Coat formed surfaces immediately after the forms are removed and in no case longer than 1 hour after the removal of forms. Do not allow concrete surface to dry before application of the membrane. If drying has occurred, moisten the surface of the concrete with a fine spray of water and apply the curing compound as soon as the free water disappears. Apply curing compound in two coats by hand-operated pressure sprayers at a coverage of approximately 200 square feet/gallon for the total of both coats. Apply the second coat in a direction approximately at right angles to the direction of application of the first coat. The compound must form a uniform, continuous, coherent film that will not check, crack, or peel and must be free from pinholes or other imperfections. If pinholes, abrasion, or other discontinuities exist, apply an additional coat to the affected areas within 30 minutes. Respray concrete surfaces that are subjected to heavy rainfall within 3 hours after the curing compound has been applied by the method and at the coverage specified above. Respray areas where the curing compound is damaged by subsequent construction operations within the curing period. Take precautions necessary to ensure that the concrete is properly cured at sawed joints, and that no curing compound enters the joints. Tightly seal the top of the joint opening and the joint groove at exposed edges before the concrete in the region of the joint is resprayed with curing compound. Use a method used for sealing the joint groove that prevents loss of moisture from the joint during the entire specified curing period. Provide approved standby facilities for curing concrete pavement at a location accessible to the jobsite for use in the event of mechanical failure of the spraying equipment or other conditions that might prevent correct application of the membrane-curing compound at the proper time. Adequately protect concrete surfaces to which membrane-curing compounds have been applied during the entire curing period from pedestrian and vehicular traffic, except as required for joint-sawing operations and surface tests, and from other possible damage to the continuity of the membrane.

3.7.2 Backfilling

After curing, remove debris and backfill, grade, and compact the area adjoining the concrete to conform to the surrounding area in accordance with lines and grades indicated.

3.7.3 Protection

Protect completed concrete from damage until accepted. Repair damaged concrete and clean concrete discolored during construction. Remove and reconstruct concrete that is damaged for the entire length between regularly scheduled joints. Refinishing the damaged portion will not be acceptable. Dispose of removed material as directed.

3.7.4 Protective Coating

Apply a protective coating of linseed oil mixture to the exposed-to-view

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concrete surface after the curing period, if concrete will be exposed to de-icing chemicals within 6 weeks after placement. Moist cure concrete to receive a protective coating.

3.7.4.1 Application

Complete curing and backfilling operation prior to applying two coats of protective coating. Concrete must be surface dry and clean before each application. Spray apply at a rate of not more than 50 square yards/gallon for first application and not more than 70 square yards/gallon for second application, except that the number of applications and coverage for each application for commercially prepared mixture must be in accordance with the manufacturer's instructions. Protect coated surfaces from vehicular and pedestrian traffic until dry.

3.7.4.2 Precautions

Do not heat protective coating by direct application of flame or electrical heaters and protect the coating from exposure to open flame, sparks, and fire adjacent to open containers or applicators. Do not apply material at ambient or material temperatures lower than 50 degrees F.

3.8 FIELD QUALITY CONTROL

Submit copies of all test reports within 24 hours of completion of the test.

3.8.1 General Requirements

Perform the inspection and tests described and meet the specified requirements for inspection details and frequency of testing. Based upon the results of these inspections and tests, take the action and submit reports as required below, and additional tests to ensure that the requirements of these specifications are met.

3.8.2 Concrete Testing

3.8.2.1 Strength Testing

Take concrete samples in accordance with ASTM C172/C172M not less than once a day nor less than once for every 250 cubic yards of concrete placed. Mold cylinders in accordance with ASTM C31/C31M for strength testing by an approved laboratory. Each strength test result must be the average of 2 test cylinders from the same concrete sample tested at 28 days, unless otherwise specified or approved. Concrete specified on the basis of compressive strength will be considered satisfactory if the averages of all sets of three consecutive strength test results equal or exceed the specified strength, and no individual strength test result falls below the specified strength by more than 500 psi.

3.8.2.2 Air Content

Determine air content in accordance with ASTM C173/C173M or ASTM C231/C231M. Use ASTM C231/C231M with concretes and mortars made with relatively dense natural aggregates. Make two tests for air content on randomly selected batches of each class of concrete placed during each shift. Make additional tests when excessive variation in concrete workability is reported by the placing foreman or the Government inspector. Notify the placing foreman if results are out of tolerance. The placing foreman must

Technical Specifications

take appropriate action to have the air content corrected at the plant. Additional tests for air content will be performed on each truckload of material until such time as the air content is within the tolerance specified.

3.8.2.3 Slump Test

Perform two slump tests on randomly selected batches of each class of concrete for every 250 cubic yards, or fraction thereof, of concrete placed during each shift. Perform additional tests when excessive variation in the workability of the concrete is noted or when excessive crumbling or slumping is noted along the edges of slip-formed concrete.

3.8.3 Thickness Evaluation

Determine the anticipated thickness of the concrete prior to placement by passing a template through the formed section or by measuring the depth of opening of the extrusion template of the curb forming machine. If a slip form paver is used for sidewalk placement, construct the subgrade true to grade prior to concrete placement. The thickness will be determined by measuring each edge of the completed slab.

3.8.4 Surface Evaluation

Provide finished surfaces for each category of the completed work that are uniform in color and free of blemishes and form or tool marks.

3.9 SURFACE DEFICIENCIES AND CORRECTIONS

3.9.1 Thickness Deficiency

When measurements indicate that the completed concrete section is deficient in thickness by more than 1/4 inch the deficient section will be removed, between regularly scheduled joints, and replaced.

3.9.2 High Areas

In areas not meeting surface smoothness and plan grade requirements, reduce high areas either by rubbing the freshly finished concrete with carborundum brick and water when the concrete is less than 36 hours old or by grinding the hardened concrete with an approved surface grinding machine after the concrete is 36 hours old or more. The area corrected by grinding the surface of the hardened concrete must not exceed 5 percent of the area of any integral slab, and the depth of grinding must not exceed 1/4 inch. Remove and replace pavement areas requiring grade or surface smoothness corrections in excess of the limits specified.

3.9.3 Appearance

Exposed surfaces of the finished work will be inspected by the Contracting Officer and deficiencies in appearance will be identified. Remove and replace areas which exhibit excessive cracking, discoloration, form marks, or tool marks or which are otherwise inconsistent with the overall appearances of the work.

3.10 DETECTABLE WARNING SYSTEM

Install Detectable Warning Systems required by Contract plans in accordance with ICC A117.1 COMM, Section 705, and by manufacturers'

Technical Specifications

installation instructions.

-- End of Section --

SECTION 32 31 13

CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A90/A90M	(2013; R 2018) Standard Test Method for Weight Mass of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings
ASTM A116	(2011) Standard Specification for Metallic-Coated, Steel Woven Wire Fence Fabric
ASTM A153/A153M	(2016a) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A702	(2013) Standard Specification for Steel Fence Posts and Assemblies, Hot Wrought
ASTM A780/A780M	(2020) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM C94/C94M	(2020) Standard Specification for Ready-Mixed Concrete
ASTM F567	(2014a) Standard Practice for Installation of Chain Link Fence
ASTM F626	(2014) Standard Specification for Fence Fittings
ASTM F883	(2013) Padlocks
ASTM F1043	(2018) Standard Specification for Strength and Protective Coatings on Steel Industrial Fence Framework
ASTM F1083	(2018) Standard Specification for Pipe, Steel, Hot-Dipped Zinc Coated (Galvanized) Welded, for Fence Structures

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS RR-F-191/3	(Rev E; Am 1) Fencing, Wire and Post, Metal (Chain-Link Fence Posts, Top Rails and Braces)
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Technical Specifications

FS RR-F-191/4

(Rev F) Fencing, Wire and Post, Metal
(Chain-Link Fence Accessories)

1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fence Assembly; G

Location of Gate, Corner, End, and Pull Posts; G

Gate Assembly; G

SD-03 Product Data

Fence Assembly; G

Gate Assembly; G

Gate Hardware and Accessories; G

Zinc Coating; G

Fabric; G

Stretcher Bars; G

Concrete; G

1.3 QUALITY CONTROL

1.3.1 Certificates of Compliance

Submit certificates of compliance in accordance with the applicable reference standards and descriptions of this section for the following:

- a. Zinc coating
- b. PVC coating
- c. Aluminum alloy coating
- d. Fabric
- e. Stretcher bars

Technical Specifications

f. Gate hardware and accessories

g. Concrete

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials to site in an undamaged condition. Store materials off the ground to provide protection against oxidation caused by ground contact.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Provide fencing materials conforming to the requirements of ASTM A116, ASTM A702, ASTM F626.

Submit reports of listing chain-link fencing and accessories regarding weight in ounces for zinc coating.

Submit manufacturer's catalog data for complete fence assembly, gate assembly, hardware assembly and accessories.

2.2 COMPONENTS

2.2.1 Fabric

Provide fabric consisting of No. 9-gage wires woven into a 2-1/4 inch diamond mesh, with dimensions of fabric and wire conforming to ASTM A116, with 1.20 ounces per square foot zinc galvanizing.

Provide one-piece fabric widths for fence heights up to 12 feet.

2.2.1.1 Top and Bottom Selvages

Provide knuckled selvages at top and bottom for fabric with 2 inch mesh and up to 60 inches high, and if over 60 inches high, provide twisted and barbed top selvege and knuckled bottom selvege.

Knuckle top and bottom selvages for 1-3/4 inch and 1 inch mesh fabric.

2.2.2 Line Posts

Minimum acceptable line posts are as specified on plans

2.2.3 End, Corner, and Pull Posts

Provide minimally acceptable end, corner, and pull posts as follows:

Up to 6 feet high:

Grade A: 2.375 inch O.D. pipe weighing 3.65 pounds per linear foot.

Grade B: 2.375 inch O.D. pipe weighing 3.12 pounds per linear foot.

Over 6 feet high:

Grade A: 2.875 inch O.D. pipe weighing 5.79 pounds per linear foot.

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Grade B: 2.875 inch O.D. pipe weighing 4.64 pounds per linear foot.

2.2.4 Sleeves

Provide sleeves for setting into concrete construction of the same material as post sections, sized 1 inch greater than the diameter or dimension of the post. Weld flat plates to each sleeve base to provide anchorage and prevent intrusion of concrete.

2.2.5 Top Rail

Provide top rails as specified on plans. Provide expansion couplings 6 inches long at each joint in top rails.

2.2.6 Center Rails Between Line Posts

For fencing over 6-feet high, provide pipe center rails as specified on plans.

2.2.7 Post-Brace Assembly

Provide bracing as shown on plans and 3/8 inch adjustable truss rods and turnbuckles.

2.2.8 Stretcher Bars

Provide bars that have one-piece lengths equal to the full height of the fabric with a minimum cross section of 3/16 by 3/4 inch, in accordance with ASTM F626.

2.2.9 Stretcher Bar Bands

Provide bar bands for securing stretcher bars to posts that are steel, wrought iron, or malleable iron spaced not over 15 inches on center. Bands may also be used in conjunction with special fittings for securing rails to posts. Provide bands with projecting edges chamfered or eased.

2.2.10 Post Tops

Provide tops that are steel, wrought iron, or malleable iron designed as a weathertight closure cap. Provide one cap for each post, unless equal protection is provided by a combination post-cap and wire supporting arm. Provide caps with an opening to permit through passage of the top rail.

2.2.11 Gate Posts

Provide a gate post for supporting each gate leaf as shown on plans

2.2.12 Gates

Provide gate frame assembly that is welded or assembled with special malleable or pressed-steel fittings and rivets to provide rigid connections. Install fabric with stretcher bars at vertical edges; stretcher bars may also be used at top and bottom edges. Attach stretcher bars and fabric to gate frames on all sides at intervals not exceeding 15 inches. Attach hardware with rivets or by other means which provides equal security against breakage or removal.

Technical Specifications

Provide diagonal cross-bracing, consisting of 3/8 inch diameter adjustable-length truss rods on welded gate frames, where necessary to obtain frame rigidity without sag or twist. Provide nonwelded gate frames with diagonal bracing.

2.2.13 Gate Hardware and Accessories

Provide gate hardware and accessories that conforms to ASTM A116 and ASTM F626, and be as specified:

Provide pressed steel hinges to suit gate size, non-lift-off type, offset to permit 180-degree opening.

Provide latch that permits operation from either side of the gate, with a padlock eye provided as an integral part of the latch.

Provide stops and holders of malleable iron for vehicular gates. Provide stops that automatically engage the gate and hold it in the open position until manually released.

Provide double gates with a cane bolt and ground-set keeper, with latch or locking device and padlock eye designed as an integral part.

2.2.14 Miscellaneous Hardware

Provide miscellaneous hot-dip galvanized hardware as required.

2.2.15 Wire Ties

Provide 10-gage galvanized steel wire for tying fabric to line posts, spaced 12 inches on center. For tying fabric to rails and braces, space wire ties 24 inches on center. For tying fabric to tension wire, space 0.105-inch hog rings 24 inches on center.

Manufacturer's standard procedure will be accepted if of equal strength and durability.

FS RR-F-191/4. Provide wire ties constructed of the same material as the fencing fabric.

2.2.16 Padlocks

Provide padlocks conforming to ASTM F883, with chain.

2.3 MATERIALS

2.3.1 Zinc Coating

Provide hot-dip galvanized (after fabrication) ferrous-metal components and accessories, except as otherwise specified.

Provide zinc coating of weight not less than 1.94 ounces per square foot, as determined from the average result of two specimens, when tested in accordance with ASTM A90/A90M.

Provide zinc coating conforming to the requirements of the following:

- a. Pipe: FS RR-F-191/3 Class 1 Grade A in accordance with ASTM F1083 .

Technical Specifications

- b. Hardware and accessories: ASTM A153/A153M, Table 1
- c. Surface: ASTM F1043
- d. External: Type B-B surface zinc with organic coating, 0.97 ounce per square foot minimum thickness of acrylated polymer.
- e. Internal: Surface zinc coating of 0.97 ounce per square foot minimum.

Provide galvanizing repair material that is cold-applied zinc-rich coating conforming to ASTM A780/A780M.

2.3.2 Tension Wire

Provide galvanized, coiled spring wire, No. 7-gage. Provide zinc coating that weighs not less than 1.2 ounces per square foot.

2.3.3 Concrete

Provide concrete conforming to ASTM C94/C94M, and obtaining a minimum 28-day compressive strength of 3,000 psi.

2.3.4 Grout

Provide grout of proportions one part portland cement to three parts clean, well-graded sand and a minimum amount of water to produce a workable mix.

PART 3 EXECUTION

Submit manufacturer's erection/installation drawings and instructions that detail proper assembly and materials in the design for fence, gate, hardware and accessories.

Provide complete installation conforming to ASTM F567.

3.1 PREPARATION

Ensure final grading and established elevations are complete prior to commencing fence installation.

3.1.1 Clearing and Grading

Clear fence line of trees, brush, and other obstacles to install fencing for a distance of 5 feet inside; and 5 feet outside the fence. Establish a graded, compacted fence line prior to fencing installation.

3.2 INSTALLATION

3.2.1 Fence Installation

Install fence on prepared surfaces to line and grade indicated. Secure fastening and hinge hardware in place to fence framework by peening or welding. Allow for proper operation of components. Coat peened or welded areas with a repair coating matching original coating. Install fence in accordance with fence manufacturer's written installation instructions except as modified herein.

Technical Specifications

3.2.1.1 Post Spacing

Provide line posts spaced equidistantly apart, not exceeding 10 feet on center. Provide gate posts spaced as necessary for size of gate openings. Do not exceed 500 feet on straight runs between braced posts. Provide corner or pull posts, with bracing in both directions, for changes in direction of 15 degrees or more, or for abrupt changes in grade. Submit drawings showing location of gate, corner, end, and pull posts.

3.2.2 Excavation

Provide excavations for post footings which are drilled holes in virgin or compacted soil, of minimum sizes as indicated.

Space footings for line posts 10 feet on center maximum and at closer intervals when indicated, with bottoms of the holes approximately 3 inches below the bottoms of the posts. Set bottom of each post not less than 36 inches below finished grade when in firm, undisturbed soil. Set posts deeper, as required, in soft and problem soils and for heavy, lateral loads.

Uniformly spread soil from excavations adjacent to the fence line or on areas of Government property, as directed. When solid rock is encountered near the surface, drill into the rock at least 12 inches for line posts and at least 18 inches for end, pull, corner, and gate posts. Drill holes at least 1 inch greater in diameter than the largest dimension of the placed post.

If solid rock is below the soil overburden, drill to the full depth required except that penetration into rock need not exceed the minimum depths specified above.

3.2.3 Setting Posts

Remove loose and foreign materials from holes and moisten the soil prior to placing concrete.

Provide tops of footings that are trowel finished and sloped or domed to shed water away from posts. Set hold-open devices, sleeves, and other accessories in concrete.

Keep exposed concrete moist for at least 7 calendar days after placement or cured with a membrane curing material, as approved.

Grout all posts set into sleeved holes in concrete with an approved grouting material.

Maintain vertical alignment of posts in concrete construction until concrete has set.

3.2.3.1 Earth and Bedrock

Provide concrete bases of dimensions indicated on the manufacturers installation drawings. Compact concrete to eliminate voids, and finish to a dome shape.

3.2.3.2 Bracing

Brace gate, corner, end, and pull posts to nearest post with a horizontal

Technical Specifications

brace used as a compression member, placed at least 12 inches below top of fence, and a diagonal tension rod .

a. Tolerances

Provide posts that are straight and plumb within a vertical tolerance of 1/4 inch after the fabric has been stretched. Provide fencing and gates that are true to line with no more than 1/2 inch deviation from the established centerline between line posts. Repair defects as directed.

3.2.4 Concrete Strength

Provide concrete that has attained at least 75 percent of its minimum 28-day compressive strength, but in no case sooner than 7 calendar days after placement, before rails, tension wire, or fabric are installed. Do not stretch fabric and wires or hang gates until the concrete has attained its full design strength.

Take samples and test concrete to determine strength as specified.

3.2.5 Top Rails

Provide top rails that run continuously through post caps or extension arms, bending to radius for curved runs. Provide expansion couplings as recommended by the fencing manufacturer.

3.2.6 Center Rails

Provide single piece center rails between posts set flush with posts on the fabric side, using special offset fittings where necessary.

3.2.7 Brace Assembly

Provide bracing assemblies at end and gate posts and at both sides of corner and pull posts, with the horizontal brace located at midheight of the fabric.

Install brace assemblies so posts are plumb when the diagonal rod is under proper tension.

Provide two complete brace assemblies at corner and pull posts where required for stiffness and as indicated.

3.2.8 Tension Wire Installation

Install tension wire by weaving them through the fabric and tying them to each post with not less than 7-gage galvanized wire or by securing the wire to the fabric with 10-gage ties or clips spaced 24 inches on center.

3.2.9 Fabric Installation

Provide fabric in single lengths between stretch bars with bottom barbs placed approximately 1-1/2 inches above the ground line. Pull fabric taut and tied to posts, rails, and tension wire with wire ties and bands.

Install fabric on the security side of fence, unless otherwise directed.

Ensure fabric remains under tension after the pulling force is released.

Technical Specifications

3.2.10 Stretcher Bar Installation

Thread stretcher bars through or clamped to fabric 4 inches on center and secured to posts with metal bands spaced 15 inches on center.

3.2.11 Gate Installation

Install gates plumb, level, and secure, with full opening without interference. Install ground set items in concrete for anchorage as recommended by the fence manufacturer. Adjust hardware for smooth operation and lubricated where necessary.

3.2.12 Tie Wires

Provide tie wires that are U-shaped to the pipe diameters to which attached. Twist ends of tie wires not less than two full turns and bent so as not to present a hazard.

3.2.13 Fasteners

Install nuts for tension bands and hardware on the side of the fence opposite the fabric side. Peen ends of bolts to prevent removal of nuts.

3.2.14 Zinc-Coating Repair

Clean and repair galvanized surfaces damaged by welding or abrasion, and cut ends of fabric, or other cut sections with specified galvanizing repair material applied in strict conformance with the manufacturer's printed instructions.

3.2.15 Accessories Installation

3.2.15.1 Post Caps

Design post caps to accommodate top rail. Install post caps as recommended by the manufacturer.

3.2.15.2 Padlocks

Provide padlocks for gate openings and provide chains that are securely attached to gate or gate posts. Provide padlocks keyed alike, and provide two keys for each padlock.

3.3 CLOSEOUT ACTIVITIES

Remove waste fencing materials and other debris from the work site.

Submit manufacturer's data indicating percentage of recycled material content in protective fence materials, including chain link fence, fabric, and gates to verify affirmative procurement compliance.

-- End of Section --

Ejemplo de Rótulo de Proyecto:

Rótulo tamaño 192"x96"



Guidelines:

<https://www.dropbox.com/sh/7cz6b5t3tp5bfww/AADi7GBByElwFVW0HFLTKEI04a?dl=0>



INFRAESTRUCTURA

INSTALACIÓN DE SISTEMA DE ALCANTARILLADO SANITARIO

SECTOR YAMBELÉ CARR 8177 KM 0.3, BO MONACILLO
SAN JUAN

INVERSIÓN: \$1,000,000.00

EMPLEOS CREADOS : 100

CONTRATO NUM 2021-

DESCRIPCION
AGENCIA



Ejemplo área
blanca (reservada)
para logos. De tenerlos
colocarlos de abajo para arriba.



INFRAESTRUCTURA

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CENTRAL OFFICE FOR RECOVERY,
RECONSTRUCTION AND DEVELOPMENT
COR3

DESCRIPCION
AGENCIA



PEDRO R. PIERLUISI
GOBERNADOR DE PUERTO RICO



DEPARTAMENTO DE TRANSPORTACIÓN Y OBRAS PÚBLICAS
DEPARTMENT OF TRANSPORTATION AND PUBLIC WORKS
GOBIERNO DE PUERTO RICO

DEPARTAMENTO DE ESTADO

Número: **7998**

Fecha: **3 de marzo de 2011**

Aprobado: **Hon. Kenneth D. McClintock**
Secretario de Estado

Por: **Eduardo Arosemena Muñoz**
Secretario Auxiliar de Servicios

UNIFORM GENERAL CONDITIONS

for

Public Works Contracts in Puerto Rico

UNIFORM GENERAL CONDITIONS

PUERTO RICO
VERDE



Public Works Contracts in Puerto Rico

UNIFORM GENERAL CONDITIONS FOR PUBLIC WORKS CONTRACTS

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CERTIFICATION

GOVERNMENT OF PUERTO RICO
DEPARTMENT OF TRANSPORTATION AND PUBLIC WORKS

UNIFORM GENERAL CONDITIONS FOR PUBLIC WORKS CONTRACTS

PART A. INTRODUCTION

ARTICLE 1 -LEGAL BASIS; APPLICATION

1.1 Legal Basis. The Secretary of Transportation and Public Works, in accordance with the powers conferred upon him by Law No. 198 of May 15, 1943, as amended by Law No. 131 of September 2, 2010 and Law No. 170 of August 12, 1988, as amended, hereby enacts the following regulations to establish the applicable legal framework for the contracting and management of all public works.

1.2. Application. The provisions of these Regulations shall be applicable to all contracts for public works executed by all government agencies, departments, public corporations and instrumentalities.

PART B. UNIFORM GENERAL CONDITIONS

ARTICLE 1 -DEFINITIONS AND TERMINOLOGY

1.1 Defined Terms

1.1.1 Wherever used in the Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof.

1.1.1.1. Agreement (or Contract) - The written instrument, which is evidence of the agreement between Owner and Contractor covering the Work.

1.1.1.2. Application for Payment - The form acceptable to Owner which is to be used by Contractor during the course of the Work in requesting progress or final payment and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

1.1.1.3. Architect/Engineer - The Architect or Engineer, referred herein as Architect/Engineer, is the collegiate professional licensed to practice architecture, engineering or surveying in the Commonwealth of Puerto Rico and is referred to throughout the Contract Documents. It is the Architect or Engineer authorized by the Owner for the preparation of all construction documents, plans and specifications and to submit such documents for the approval of the related public agency. The Architect/Engineer may designate an authorized representative. The Architect/Engineer is the individual or entity named as such in the Agreement.

1.1.1.4. Architect/Engineer's Consultant - An individual or entity having a contract with the Architect/Engineer to furnish services as Architect/Engineer's independent professional and collegiate consultant with respect to the Project and who is identified as such in the Supplementary Conditions.

1.1.1.5. Bonds - Performance and Payment bonds and other instruments of surety required in the Contract Documents.

UNIFORM GENERAL CONDITIONS FOR PUBLIC WORKS CONTRACTS

1.1.1.6. Certificate of Final Acceptance - Certificate issued by the Owner, or its duly authorized representative to Contractor indicating the date that the Work reached Final Acceptance.

1.1.1.7. Certificate of Substantial Completion - Certificate issued by the Owner, or its duly authorized representative, to the Contractor indicating the date that Substantial Completion was achieved for the Work.

1.1.1.8. Change in Law - Change in Law shall include: (i) the enactment or adoption by any legislative, regulatory, executive or administrative body of the Commonwealth of Puerto Rico or of the United States of America of any law, or any change or amendment to any law, in force as of the bid opening date, (ii) any change in the interpretation thereof which is final and not subject to administrative or judicial review, which cannot be complied with by a party without incurring in additional costs.

1.1.1.9. Change Order - A written order issued by the Owner, or its duly authorized representative, to the Contractor, signed by both parties, covering, additions, deletions, and/or revisions in the Work and/or an adjustment in the Contract Price and/or the Contract Time, if any, issued on or after the Effective Date of the Agreement. In Unit Price Contracts, a Change Order can also reflect a change in the number of items, as well as an increase or decrease, contained in the proposal. In Lump Sum Contracts, it reflects an order for additional or less work.

1.1.1.10. Claim - A claim is a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension of time or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. Claims must be made by written notice and in accordance with Article 11.5. The responsibility to substantiate Claims shall rest with the party making the Claim.

1.1.1.11. Commonwealth - The Commonwealth of Puerto Rico.

1.1.1.12. Construction Change Directive - A Construction Change Directive is a written order signed by the Owner, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Price or Contract Time, or both. The Owner may, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Price and Contract Time adjusted accordingly. A Construction Change Directive shall be used only in the absence of total agreement on the terms of the Change Order, Extra Work Order or Work Change Directive, and shall be paid with the monthly Progress Payment according to the method indicated in Article 10.1.2.3.

1.1.1.13. Contract (or Agreement) - The entire and integrated written Agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

1.1.1.14. Contract Documents - The Contract Documents establish the rights and obligations of the parties and include: (i) the Agreement, (ii) addenda (which pertain to the Contract Documents), (iii) Contractor's bid or proposal (including documentation accompanying the Bid and any post Bid documentation submitted prior to the Notice of Award), (iv) the Notice to Proceed, (v) the Bonds, (vi) these General Conditions, (vii) the Supplementary Conditions, (viii) the Special Provisions, (ix) the Specifications, (x) the Drawings as the same are more specifically identified in the Agreement, including Standard Drawings, if applicable and (xi) Instructions to Bidders. It shall also include: (i) all Written Amendments, (ii) Change Orders and Extra Work Orders, (iii) Work Change Directives, (iv) Field Orders and (v) Architect/Engineer's written interpretations and clarifications issued on or after the Effective Date of the Agreement. Approved Shop Drawings and the reports and drawings of subsurface and physical conditions are not Contract Documents. Only printed or hard copies of the items listed in this Article are Contract Documents. Files in electronic media format of text, data, graphics, and the like that may be furnished by Owner to Contractor are not Contract Documents, unless otherwise specified in the bid documents.

UNIFORM GENERAL CONDITIONS FOR PUBLIC WORKS CONTRACTS

1.1.1.15. Contract Item or Pay Item - A portion of Work specifically described and for which a price either unit or lump sum is provided. It includes the performance of all Work and the furnishing of labor, equipment and materials described in the Specifications.

1.1.1.16. Contract/Project Limits - The area, including Site and off-Site, within which the Work is to be performed.

1.1.1.17. Contract Price - See Contract Sum.

1.1.1.18. Contract Sum - It is the Contract Price as stated in the Agreement and is the total amount payable by the Owner to the Contractor for the performance of the Work under the Contract Documents subject to additions and deductions, stipulated in the Contract Documents.

1.1.1.19. Contract Time or Time - It is the period of time allotted in the Contract Documents for Substantial Completion of the Work.

1.1.1.20. Contract Unit - A major subdivision of the construction Project identified as such in the Contract Documents.

1.1.1.21. Contracting Officer - The Contracting Officer is the authorized representative of the Owner under the Contract Documents.

1.1.1.22. Contractor - The Contractor is the person or organization that contracts with the Owner for the performance of the Work described in the Contract Documents. The term Contractor, identified as such in the Agreement, means the Contractor or his authorized representative. In cases of Design-Build Contracts, the term Contractor shall also signify the Design-Builder Contractor.

1.1.1.23. Cost of the Work - See section 10.2 for definition.

1.1.1.24. Day - The word "day" shall constitute a calendar day of twenty-four (24) hours measured from midnight to the next midnight.

1.1.1.25. Design-Build Contracts - Shall be those contracts where the Contractor undertakes the duty to design the Work, in addition to performing the duties of Contractor.

1.1.1.26. Design-Builder Contractor - Shall be the Contractor in Design-Build Contracts, who in addition to having all duties of Contractor has the duty to design the Work, as specified in the Contract Documents.

1.1.1.27. Dispute - Any Claim, dispute or other disagreement involving the interpretation of the Contract Documents, a change in the Contract Sum, and or a change in the Contract Time, and other matters in question arising out of, or relating to the Contract or the breach thereof, except for Claims which have been waived by lack of proper notice and/or the making or acceptance of final payment as provided in Articles 13.7.2 and 13.9.1

1.1.1.28. Drawings or Plans - The approved drawings and supplementary drawings showing the location, character, dimensions, and details of the Work to be done which are part of the Contract Documents.

1.1.1.29. Effective Date of the Agreement - The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the parties to the Contract.

1.1.1.30. Engineer or Architect - See Architect/Engineer.

UNIFORM GENERAL CONDITIONS FOR PUBLIC WORKS CONTRACTS

1.1.1.31. Equal or Similar and Substitute - "Similar or Equal" or "Substitute", when used in relation to materials, parts, machinery, equipment, formulas of the Project and/or anything to them related, shall mean that they be of substantially the same quality, form, appearance, resistance, endurance, efficiency, capacity, safety, specifications and any other quality inherent, or related, to them as they are indicated in the drawings and/or specifications of the Contract.

1.1.1.32. Equipment - All machinery and implements, together with the necessary supplies for upkeep and maintenance, and all tools and apparatus necessary for the proper construction and acceptable completion of the Work.

1.1.1.33. Extra Work - An item of Work not provided for in the Contract as awarded but found by the Owner or its duly authorized representative necessary for the satisfactory completion of the Contract within its generally intended scope.

1.1.1.34. Extra Work Order - Is a written order issued by the Owner to Contractor and signed by both parties in a unit price contract concerning the performance of the Work or furnishing of materials involving Extra Work. It authorizes a change in the Work, adjustments in the Contract Price and/or Contract Time for services, or Work, for which there is no basis of payment, either direct or indirect, provided in the proposal, or Contract, or if the resulting overruns, or underruns, of any item, or items, exceed certain percentages. Extra Work Orders apply only to unit price contracts. Such Extra Work may be performed at agreed prices or as provided in Section 10.2 of these General Conditions.

1.1.1.35. Federal Agency - Any agency of the government of the United States of America or its succeeding agency.

1.1.1.36. Field Order - A written order issued by the Owner that requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Time.

1.1.1.37. Final Acceptance - Shall mean the acceptance of the Work by the Owner after the final inspection as evidenced by the Certificate of Final Acceptance sent to Contractor by Owner.

1.1.1.38. Force Account Work - Additional Work that is paid for based on the Cost of the Work as defined in Article 10.2.

1.1.1.39. Force Majeure - Means an act of God; earthquake; tidal wave; hurricane; act of the public enemy; war; blockade; public riot; lighting; fire; flood; explosion; a strike, excluding strikes and any other activity or demonstration by Owner's personnel that does not interfere directly with the Work; and any other cause, whether of the kind specifically enumerated herein or otherwise, which is not reasonably within the sole control of Contractor. A rain, windstorm flood or other natural phenomenon of normal intensity for the particular locality shall not be construed as Force Majeure.

1.1.1.40. Hazardous Environmental Condition - The presence at the Site of asbestos, PCBs, petroleum, hazardous waste, or radioactive material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto in connection with the Work.

1.1.1.41. Hazardous Waste - The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 U.S.C. §6903) as amended.

1.1.1.42. Holidays - Saturdays, Sundays and the legal holidays listed below on which the Contractor will not be allowed to perform Work under the Contract except as otherwise ordered or authorized in writing by the Owner. All other Holidays not listed below will be considered working days. Also, if any of the listed holidays falls on a Sunday, the following Monday will be considered a holiday.

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New Year's Day	January 1
Three Kings Day	January 6
Good Friday	Variable
Independence Day	July 4
Constitution Day	July 25
Labor Day	First Monday of September
Election Day (when occurring)	Tuesday after 1 st Monday in November
Thanksgiving	Fourth Thursday in November
Christmas Day	December 25

1.1.1.43. Laboratory - The material testing laboratory of the Owner or any other testing laboratory which may be approved by the Owner or its duly authorized representative.

1.1.1.44. Laws and Regulations; Laws or Regulations - Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

1.1.1.45. Liens - Charges, security interests, or encumbrances upon Project funds, real property, or personal property.

1.1.1.46. Major and Minor Contract Items - Any item having a Contract value equal to or greater than five per cent (5%) of the original Contract amount shall be considered as a major item. All the other Contract items shall be considered as minor items. A minor item may become a major item when the minor item is increased to the extent that the total cost of the item is equal to or greater than five per cent (5%) of the original Contract amount.

1.1.1.47. Materials - Any substances specified for use in the construction of the Project and its appurtenances.

1.1.1.48. Milestone - A principal event specified in the Contract Documents related to an intermediate completion date or time prior to the Substantial Completion of the whole Work.

1.1.1.49. Notice of Award - The written notice by the Owner to the apparent successful bidder stating that upon timely compliance by the apparent successful bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.

1.1.1.50. Notice to Proceed - A written notice issued by the Owner to the Contractor fixing the date on which the Contract Time will commence to run and on which Contractor shall start to perform the Work under the Contract Documents. Such Notice to Proceed shall identify the persons included in article 5.2.2. Unless otherwise agreed by the parties, all permits and/or endorsements to be furnished by the Owner needed to start construction of the Project must be obtained prior to issuance of the Notice to Proceed.

1.1.1.51. OCIP - see Owner-Controlled Insurance Program.

1.1.1.52. Off-Site Work - Work to be performed outside of the of the Project's limits.

1.1.1.53. Owner - The Owner is the Department, Agency, Public Corporations, or any other instrumentality of the Commonwealth of Puerto Rico as identified in the Agreement and is referred to throughout the Contract Documents as if singular in number and masculine in gender. The term Owner means the Owner or his authorized representative. It shall also mean any person, or entity, named as such in the Contract Documents.

1.1.1.54. Owner-Controlled Insurance Program - also known as "OCIP". An insurance program under which

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Commercial General Liability, Excess General Liability, Builder's Risk, and Contractor's Pollution Liability coverage are procured or provided by the Owner for the Contractor, Subcontractors of any tier, who have been properly enrolled, while performing operations at the Project Site.

1.1.1.55. Owner's Representative - One or more persons or entity designated by the Owner, who will perform the functions of the Owner as described in these General Conditions. The Owner's Representative may employ Project Inspectors and/or other assistants to perform any function, duty or responsibility, as delegated by the Owner's Representative, including but not limited to the detailed inspections of performance of any or all portions of the Work.

1.1.1.56. Partial Utilization - Use by Owner of a substantially completed part of the Work for the purpose for which it is intended (or a related purpose) prior to Substantial Completion of all the Work.

1.1.1.57. Pay Item - See Contract Item.

1.1.1.58. Payment Bond - The security required to be furnished by the Contractor and his Surety and approved by the Owner to guarantee the payment of all persons or entities supplying labor, material and equipment in the prosecution of the Work or services required for completion of the Contract.

1.1.1.59. Performance Bond - The security required to be furnished by the Contractor and his Surety and approved by the Owner to guarantee the completion of all the requirements of the Contract.

1.1.1.60. Plans - See Drawings.

1.1.1.61. Project - The total construction of which the Work to be performed under the Contract Documents is the whole, or part.

1.1.1.62. Project Inspector - The professional, duly licensed and collegiate Engineer or Architect, or a legally qualified entity, contracted and/or designated by the Owner and/or the Owner's Representative to perform, as a Project Inspector, the continuous on Site inspection of any or all portions of the Work.

1.1.1.63. Project Manager - The professional licensed and collegiate Engineer or Architect, designated in accordance with the Contract as the Contractor's authorized representative who is made by Contractor responsible for and placed in charge of the Work.

1.1.1.64. Project Manual - The bound documentary information prepared for bidding and constructing the Work.

1.1.1.65. Project Schedule - A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Work within the Contract Times, as required by Article 6.4 of these General Conditions.

1.1.1.66. Reasonable Close Conformity - Compliance with reasonable and customary manufacturing and construction tolerances when working tolerances are not specified. When working tolerances are specified, reasonably close conformity means compliance with such working tolerances. Without detracting from the complete and absolute discretion of the Owner or its duly authorized representative to insist upon compliance with such tolerances, the Owner or its duly authorized representative may, at his sole option and reasonable discretion, accept variations beyond such tolerances when and where they will not materially affect the value or utility of the Work and the interests of the Owner.

1.1.1.67. Reference Specifications - Specifications issued by other official and/or professional organizations that are referred to and made part of the Owner's specifications and other Contract Documents. Unless otherwise specifically indicated in the Contract Documents, references cited shall be the edition of such specifications in effect at the time the Project is advertised for bids/proposals.

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1.1.1.68. Right of Way - A general term denoting land, property, easement or interest therein, usually in a strip, acquired for the Project or for the benefit of another project or public utility.

1.1.1.69. Samples - Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

1.1.1.70. Shop Drawings or Working Drawings - All drawings, diagrams, schedules, and other data or information, which are specifically prepared or assembled by or for the Contractor and submitted by Contractor to illustrate some portion of the Work.

1.1.1.71. Site - Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner that are designated for the use of Contractor. It shall also mean areas for the performance of off-site work, if same is required in the Contract Documents.

1.1.1.72. Special Conditions - Special requirements, regulations or direction, covering conditions peculiar to a particular project. Special Conditions shall prevail over particular provisions of these General Conditions only when such option is provided in any particular Article of these General Conditions by the use of words such as "unless otherwise indicated in the Contract Documents..." In all other instances these General Conditions shall prevail over any conflicting provision contained in the Special Conditions.

1.1.1.73. Specialty Item - A Contract Item, which is specifically identified in the Contract Documents as exempted from the computations to determine the total amount of the Work that the Contractor may be authorized to subcontract.

1.1.1.74. Specifications - That part of the Contract Documents consisting of written Technical Specifications, descriptions of materials, equipment, systems, standards, and workmanship as applied to the Work and certain administrative details applicable to the Work.

1.1.1.75. Standard Drawings - See Standard Plans.

1.1.1.76. Standard Plans (or Standard Drawings) - Drawings approved for repetitive use, showing details to be used where appropriate, included in the Plans or published as a separate document.

1.1.1.77. Standard Specifications - The set of specifications approved by the Owner for general application and repetitive use.

1.1.1.78. Subcontractor - A Subcontractor is an individual or entity that has a direct contract with the Contractor to perform any of the Work at the Site. The term Subcontractor as referred throughout the Contract Documents means the Subcontractor or his authorized representative.

1.1.1.79. Substantial Completion - The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of the Owner, or its authorized representative, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

1.1.1.80. Supplemental Agreement - A written agreement executed by the Contractor and Owner supplementing the Contract to cover Extra Work and/or changes and/or changed conditions incidental to and necessary for the acceptable completion of the Project.

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1.1.1.81. Supplemental Specifications - Approved additions and/or revisions to the Standard Specifications, including Technical Specifications.

1.1.1.82. Supplementary Conditions - That part of the Contract Documents that amends, or supplements, where allowed, these General Conditions.

1.1.1.83 Supplier - A manufacturer, fabricator, supplier, distributor, materialmen, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work.

1.1.1.84. Surety - The insurance or bonding corporation or other legal entity, other than the Contractor, authorized to do business in Puerto Rico, bound with and for the Contractor for the proposal guaranty and/or the Payment Bond and/or the Performance Bond, or other bonds and insurances required by the Contract Documents.

1.1.1.85. Technical Specifications - The directions, provisions and requirements setting forth, or relating to, the performance of the Work and to the kind and quality of materials and labor to be furnished under the Contract for the execution of the Project. Any entity making changes in the Technical Specifications and/or Plans and Drawings, must perform so complying with all laws, codes, rules and regulations applying to them.

1.1.1.86. Underground Facilities/Utilities - All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any easements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

1.1.1.87. Unit Price Work - Work to be paid for based on unit prices.

1.1.1.88. Utility - A public or privately owned agency or entity and the lines and facilities for producing, transmitting or distributing data or voice communications, power, electricity, gas, oil, gasoline, water, sewer and similar commodities for public or private use.

1.1.1.89. Work - The entire construction referred to in the Agreement and the performance of the services identified to be provided in the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce and make workable such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

1.1.1.90. Work Change Directive - A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by the Owner and recommended by the Architect/Engineer ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Time but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Time.

1.1.1.91. Work Order - A written order, signed by the Owner, or its duly authorized representative, which requires performance of a specific contractual issue by the Contractor without negotiation of any sort. If Contractor is not in agreement with the Work Order, he may present a Claim as established in Article 11.5.

1.1.1.92. Working Day - A calendar day, exclusive of Saturday and Sunday and designated legal holidays. All periods of time under the Contract Documents shall be measured in calendar days, unless Working Days are specified.

1.1.1.93. Working Drawings - See Shop Drawings.

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1.1.1.94. Written Amendment - See Supplemental Agreement.

1.2 Other Terms - The Owner's manuals and sets of regulations contain additional terms, not included above, which are used in the plans and other Contract Documents. Such terms shall be interpreted as defined in the Owner's manuals and sets of regulations.

1.3 Terminology

1.3.1 Intent of Certain Terms or Adjectives.

1.3.1.1. Unless otherwise indicated in the Contract Documents, whenever in the Contract Documents the terms "as allowed," "as approved," or terms of like effect or import are used, or the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Architect/Engineer as to the Work, it is intended that such action or determination will be solely to evaluate, in general, the completed Work for compliance with the requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective shall not be effective to assign to Architect/Engineer any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of these General Conditions and the Contract Documents.

1.3.2 Deficient.

1.3.2.1. The word "deficient," when modifying the word "Work," refers to Work, or part of it, that is unsatisfactory, faulty, or defective in that it does not conform to the Contract Document or does not meet the requirements of any inspection, reference standard, test, or approval referred to in the Contract Documents, or has been damaged prior to Owner's Representative's recommendation of final payment, unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with these General Conditions.

1.3.3 Furnish, Install, Perform, Provide.

1.3.3.1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use, assembling, or installation and in usable or operable condition.

1.3.3.2. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position, said services, materials, or equipment complete and ready for intended use.

1.3.3.3. The words "perform" or "provide," when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

1.3.3.4. When "furnish," "install," "perform," or "provide" is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, "install," "perform" and/or, "provide" is implied.

1.3.4 Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

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ARTICLE 2 - CONTRACT DOCUMENTS

2.1 Intent and Interpretation of Contract Documents

2.1.1 The Contract Documents constitutes the Contract. The Contract Documents represent the entire and integrated agreement between the parties hereto and supersedes all prior negotiations, representations, or agreements, either written or oral, including the bidding documents. The Contract Documents may be amended or modified as set forth in section 2.6.

2.1.2 The intent of the Contract Documents is to provide for the construction and completion of the Work described.

2.1.3 The Contractor shall furnish all labor, materials, equipment, tools, transportation and supplies required to complete the Work in accordance with the plans, specifications and terms of the Contract Documents.

2.1.4 The relationship which the parties intend to create under the Contract Documents is that of principal and independent Contractor and nothing herein is intended or shall be construed, so as to create a relationship of any kind, form or manner, such as but not limited to partnership, co-venturers, or employment between the Owner and Contractor, unless clearly otherwise expressed in the Contract Documents.

2.2 Order of Precedence of Contract Documents

2.2.1 The Contract Documents for each particular Project shall specify the order of precedence among the diverse documents that form the Contract Documents, except for the order of precedence of the General Conditions which may not be altered unless allowed to be altered by means of the Special Conditions as described in Article 1.1.1.72. If no such order of precedence is established in the Contract Documents for the Project, the following order shall be followed:

2.2.1.1. Agreement (which shall include the Bonds and required insurance policies).

2.2.1.2. Dated Contractor's Proposal

2.2.1.3. All addenda issued prior to Bid Date. Unless no conflict exist between addenda, the issuance of a subsequent addendum will supersede all previously issued addenda.

2.2.1.4. Instructions to Bidders

2.2.1.5. The General Conditions of the Contract, (except where in accordance with Article 1.1.1.72 they are allowed to be changed by the Special Conditions).

2.2.1.6. Special Conditions.

2.2.1.7. Plans or Drawings

2.2.1.8. The Standard Drawings.

2.2.1.9. Specifications.

2.2.1.10. Technical Specifications.

2.2.1.11. Supplemental Specifications.

2.2.1.12. Standard Specifications.

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23 Written Interpretations

2.3.1 Provided reasonable time is granted to Owner, written interpretations necessary for the proper execution or progress of the Work in the form of drawings, or otherwise, will be issued with reasonable promptness by the Owner, its designated representative, or Architect/Engineer so as not to adversely affect the critical path of the Project Schedule.

2.3.2 Contractor may make written request to the Owner, Owner's Representative, or the Architect/Engineer for such interpretations, when deemed necessary for the proper progress of the Work.

2.3.2.1. Such interpretations shall be consistent with and reasonably inferable from the Contract Documents and may be effected by Field Orders.

2.3.2.2. Interpretation drawings are not necessarily changes in the Work.

2.3.3 Except as may otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:

2.3.3.1. the provisions of any standard, specification, manual, code, or instruction (whether or not specifically incorporated by reference in the Contract Documents); or

2.3.3.2. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

24 Execution and Correlation

2.4.1. The Agreement shall be signed by the Owner and Contractor or their authorized representatives. The other component parts of the Contract Documents, if not signed by the Owner or Contractor, shall be marked by their authorized representative.

2.4.2 By executing the Contract Documents, the Contractor represents that he has visited the Contract Limits within the Site, familiarized himself with the local conditions under which the Work is to be performed, correlated his observations with the requirements of Contract Documents, and accepts the same.

2.4.2.1 The Owner warrants that it has submitted all the necessary documents required of Owner to be submitted to the appropriate governmental agencies needed for the prosecution of the Work, as required by applicable laws and regulations.

2.4.3 The Owner and the Contractor acknowledge that no service or Work under the Contract Documents will be performed until both parties duly sign the Contract and the Notice to Proceed is issued.

2.4.3.1. No payment and/or disbursement will be made or paid for services rendered in violation of this clause.

2.4.4 The Contract Time.

2.4.4.1. The Contract Time must be specifically expressed on the Contract.

2.4.4.2. The Contract Time will be extended by the same number of days in which the term to execute the Work is extended by Change Orders or by any other mean allowed or permitted by the Contract or Contract Documents.

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2.4.4.3. Furthermore, the parties agree that no Work or service will be performed or received beyond Final Acceptance of the Contract.

2.4.4.4. No payment and/or disbursement will be made or paid for services rendered in violation of this clause.

2.4.5 The Contract Documents are complementary, and what is required by anyone shall be as obligatory as if required by all. The intention of the Contract Documents is to include all labor, materials, equipment and other items as provided on these General Conditions necessary for the proper execution and completion of the Work.

2.4.5.1. It is not intended that Work not covered under any heading, section, branch, class or trade of the Specifications shall be supplied unless it is required elsewhere in the Contract Documents.

2.4.5.2. The organization of the Specifications in divisions, sections, articles, and the arrangement of drawings shall not control the Contractor in dividing the Work among subcontractors or in establishing the extent of Work to be performed by any trade.

2.5 Review of Contract Documents and Field Conditions by Contractor.

2.5.1 Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents with each other and check and verify pertinent dimensions and quantities therein and all applicable field measurements.

2.5.2 Contractor shall promptly report in writing to Owner any conflict, error, ambiguity, inconsistency, discrepancy, or omission that Contractor may discover and shall obtain a written interpretation or clarification from Owner before proceeding with any Work affected by said conflict, error, ambiguity, inconsistency, discrepancy or omission.

2.5.2.1. However, Contractor shall not be liable to Owner for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents, unless Contractor failed to report it to the Owner with sufficient time for the Owner to provide a solution before the critical path of the Project is affected.

2.5.2.2. If the Contractor performs any construction activity in violation of this Article 2.5, the Contractor shall assume appropriate responsibility for such performance and shall bear an appropriate amount of the costs attributed to correction.

2.5.2.3. The Owner shall provide a solution to any reported conflict, error, ambiguity, discrepancy, or omission and if such solution adversely affects cost or the critical path of the Project, Owner will adjust Contract Price and Contract Time accordingly.

2.6 Amending and Supplementing Contract Documents

2.6.1 The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof in one (1) or more of the following ways:

2.6.1.1. a Written Amendment;

2.6.1.2. a Change Order;

2.6.1.3. an Extra Work Order; or

2.6.1.4. a Work Change Directive.

2.6.2 The requirements of the Contract Documents may be supplemented and minor variations and deviations in

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the Work may be authorized, by one (1) or more of the followings ways:

2.6.2.1. a Field Order;

2.6.2.2. Owner's, or his authorized representative's, approval of a Shop Drawing or Sample; or

2.6.2.3. Owner's, his authorized representatives, or Architect/Engineer's written interpretation or clarification.

2.6.3 A modification may be made only after execution of the Contract.

2.7 Copies Furnished, Ownership and Reuse of Documents

2.7.1. The Contractor will be furnished, free of charge, four (4) complete copies of the Contract Documents. Additional copies will be furnished upon request at the cost of reproduction. If Contractor so requests it, Owner will also furnish, free of charge, if available, an electronic file in PLT format (plot to File) so that the Contractor may make the copies of plans and/or drawings that he needs to build the Project. If such electronic files are not available, the Owner shall allow the Contractor to prepare electronic files and to print, at Contractor's cost, but without additional payment to Owner or Architect/Engineer, those copies needed for use by Contractor.

2.7.2. All Drawings, Specifications and copies thereof furnished by the Owner, Architect/Engineer, or Owner's Representative are, and shall remain, property of the Owner.

2.7.2.1. The Contractor can make copies of all the Drawings, Specifications, and other Contract Documents without permission, and without the payment of any fees or royalties, to the Owner, Architect/Engineer, or Owner's Representative as long as they are necessary for use in the execution of the Work.

2.7.3. Contractor and any Subcontractor or Supplier or other individual or entity performing or furnishing any of the Work under a direct or indirect contract with Owner:

2.7.3.1. shall not have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Owner, Architect/Engineer or Engineer's Consultant, including electronic media editions; and

2.7.3.2. shall not reuse any of such Drawings, Specifications, other documents, or copies thereof on extension of the Project or any other project without written consent of Owner.

2.7.4 This prohibition will survive final payment, completion, and acceptance of the Work, or termination or completion of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

ARTICLE 3- BONDS AND INSURANCE

3.1 General- For Owners with OCIP

3.1.1 The Contractor shall not commence work under the Contract until he has obtained the various insurances policies and bonds specified in the Owner's Controlled Insurance Program. Owner shall provide to Contractor an exact copy of the applicable Owner Controlled Insurance Program manual together with the Contract Documents.

3.2 General- For Owners without OCIP.

3.2.1 The Contractor shall not commence work under the Contract until he has obtained the various

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insurances and bonds specified in this section and has submitted to the Owner certificates of insurance (and other evidence requested by Owner) evidencing his compliance with the various insurance requirements set forth in this Article.

3.2.1.1. Unless otherwise indicated in the Contract Documents, Contractor must, within ten (10) calendar days from the Notice of Award, provide to Owner, in form satisfactory to Owner as provided in detail in this Article, the following:

3.2.1.1.1. Performance Bond

3.2.1.1.2. Payment Bonds

3.2.1.1.3. Workmen's Compensation Insurance Policy issued by The Puerto Rico State Insurance Fund and all Social Insurances required by law.

3.2.1.1.4. General Liability Insurance

3.2.1.1.5. Business Auto Policy

3.2.1.1.6. Contract Works Policy (Builder's Risk)

3.2.1.1.7. Installation Floater Policy (when applicable)

4 3.2.2 Notwithstanding the requirements set forth in this Article, the Owner may opt out of part of the requirements included in this Article and require any and all other policies that it understands are needed for its particular construction projects, including other policies not required herein.

3.2.2.1. However, such decision to opt out of part of the requirements of this Article must be written and signed by the Owner stating particularly the reasoning behind it. Such written decision must be made part of Owner's Project file.

3.2.3. The insurance and bond policies required herein shall be obtained from insurance and surety companies complying with the requirements of Puerto Rico's Insurance Commissioner.

3.2.3.1. Prior to Bid announcement Date, Owner will publish a list of unacceptable insurance and bonding companies so that Contractor has knowledge of which companies are not authorized to provide insurances or bonds for the Work. Unless otherwise indicated in the Contract Documents, the Contractor must obtain an endorsement naming the Owner as an additional insured in each of the required insurance policies in this Article (as applicable).

3.2.4 The Contractor shall, throughout the performance of Work under the Contract and until the Final Acceptance of the Project, maintain current, and in effect all the required insurance, except the Contract Works Policy (Builder's Risk), which shall terminate on the date of Substantial Completion.

3.2.4.1. If on the termination date of any of the policies, the Project is still under construction and the Contractor has not renewed the policies, the Owner can renew them and deduct the amount paid for the premium, and applicable costs from the next payment, only if Contractor does not remedy and provide timely evidence of coverage.

3.2.5. Insurance coverage in the minimum limit amounts set forth herein shall not be construed to release the

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Contractor from liability in excess of such coverage limit. Contractor must give thirty (30) calendar days written notice to Owner before any policy coverage is changed, canceled or not renewed and shall cause the insurance carrier to do the same.

3.2.6 Acceptance of Insurance; Option to Replace. If either Owner or Contractor has any objection to the coverage afforded by or to other provisions of the insurance required to be purchased and maintained by the other party in accordance with this Article on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within twenty (20) days after receipt of the certificates of insurance and bonds (or other such evidence) required by Article 3.1.1.

3.2.6.1. Owner and Contractor shall each provide to the other such additional information with respect to insurance provided as the other may reasonably request.

3.2.6.2. If either party fails to purchase or maintain all of the insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure prior to the start of the Work, or of such failure is to maintain, prior to any change in the required coverage.

3.2.6.3. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent insurance to protect such other party's interest at the expense of the party who was required to provide such coverage, and a Change Order (or Extra Work Order in a unit price Contract) shall be issued to adjust the Contract Price accordingly.

3.2.7. If Owner finds it necessary or convenient to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in section 14.5 no such use or occupancy shall commence before the insurers providing the property insurance pursuant to section 3.6 have acknowledged notice thereof and in writing effected any changes in coverage needed thereby.

3.2.7.1. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

3.2.7.2. If the Owner accepts, occupies, or uses a portion, or portions, of the Work for its intended use, or whatever use he deems necessary or convenient, it is the Owner's responsibility to insure the property comprising said portion, or portions of the Work.

3.2.7.3. If the Contractor obtained the Contract Works Policy (Builder's Risk) for the Work, the Owner may request that Contractor continues to carry said insurance and will pay the cost, as a Change Order, based on the proportion of the occupied area versus the total Project area.

3.2.7.4. If requested by Contractor, the Owner shall supply copy of its insurance policy, and/or certificate of insurance evidencing that said portion, or portions, of the Work now under the Owner's care, custody and control is properly insured.

3.3 Performance, Payment, and Other Bonds

3.3.1. Unless otherwise stated in the Contract Documents, the Contractor must, within ten (10) calendar days from the date of Notice of Award, furnish and file with the Owner, in form satisfactory to, and with Sureties approved by the Owner, the following:

3.3.1.1. Performance Bond to guarantee the faithful performance of the Contract, in an amount equal to at least fifty percent (50%), but not more than one hundred percent (100%) of the Contract Sum, as stated in the Supplementary General Conditions of the Contract. If none is stated, the amount shall be one hundred percent

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(100%) of the Contract Sum.

3.3.1.2. Payment Bond, including Labor Bond in an amount equal to at least fifty percent (50%), but not more than one hundred percent (100%) of the Contract Sum, as stated in Supplementary General Conditions of the Contract. If none is stated, the amount shall be one hundred percent (100%) of the Contract Sum.

3.3.1.3. A separate and additional Payment Bond in an amount equal to the requirements of Law No. 111, approved June 22, 1961, as it may be amended in the future, payable to the Secretary of Labor of the Commonwealth of Puerto Rico to guarantee payment to laborers and employees of the Contractor.

3.3.1.4. Contractor shall also furnish such other Bonds as are required by the Contract Documents.

3.3.2. The Payment and Performance Bonds shall remain in effect as follows:

3.3.2.1. Under the Performance Bond: one (1) year after the date when the final payment becomes due for warranty work, as stipulated in the warranty clause, or as provided otherwise by Laws or Regulations or by the Contract Documents.

3.3.2.2. Under the Payment Bond: six (6) months after the retainage is paid in full to the Contractor, except as provided otherwise by Laws or Regulations or by the Contract Documents.

3.3.3 All Bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations. All Bonds must be signed by an attorney in fact duly authorized by the Commissioner of Insurance of Puerto Rico, and must be accompanied by a certified copy of such power of attorney.

3.3.4 If the Surety on any Bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of the Puerto Rico's Insurance Commissioner, Contractor shall within twenty (20) days thereafter substitute said Bond and Surety with acceptable substitutes.

3.4 Workmen's Compensation Insurance

3.4.1 The Contractor shall provide Worker's Compensation Insurance as required by the "Workers' Compensation Act of the Commonwealth of Puerto Rico". The Contractor shall furnish the Owner a certificate from the State Insurance Fund Corporation covered by the Workers' Compensation Act of the Commonwealth of Puerto Rico.

3.4.2 The Contractor shall also be responsible for compliance with said "Workers' Compensation Act" by all his subcontractors and agents.

3.5 Contractor's Liability Insurance

3.5.1 Contractor shall purchase and maintain the following liability insurance coverage, in an occurrence format, and other insurance as is appropriate for the Work being performed and will provide protection from claims set forth which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:

3.5.1.1. Limits. Unless otherwise stated in the Special Conditions of the Contract, the liability insurance limits shall not be less than:

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3.5.1.1.1. General Aggregate Limit	\$1,000,000
3.5.1.1.2. Products/Completed Operations Aggregate Limit	\$1,000,000
3.5.1.1.3. Personal and Advertising Injury Limits	\$ 500,000
3.5.1.1.4. Each Occurrence Limit	\$ 500,000
3.5.1.1.5. Fire Damage Limit	\$ 50,000
3.5.1.1.6. Medical Expense Limit	\$ 5,000

3.5.1.2. Claims for damages because of bodily injury, occupational sickness or disease, or death of any person other than Contractor's employees;

3.5.1.3. Claims for damages insured by reasonably available personal injury liability coverage which are sustained: (i) by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or (ii) by any other person for any other reason;

3.5.1.4. Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting there from.

3.5.2 The insurance policies so required by this section 3.4 to be purchased and maintained, unless otherwise specified in the Contract Documents, shall:

3.5.2.1. include at least the specific coverage and be written for no less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater,

3.5.2.2. include complete operations/premises/products insurance;

3.5.2.3. include contractual liability insurance covering Contractor's indemnity obligations under these General Conditions. Unless otherwise specified in the Contract Documents, the indemnity clause shall read as follows:

3.5.2.3.1. The Contractor for itself, agents, employees, successors and assigns agrees to save harmless the Owner, its Officers, Agents, Employees and Architect/Engineer from and against any and all claims, demands and/or suits, except as stated below, whether judicial or extra judicial for any cost whatever arising out or related to the execution of the Contract, and its insurers shall defend the Owner, its officers, agents, Employees and Architect/Engineer from such claims, demands and/or suits and shall bear all the expenses for such defense contemplated within the coverage limits provided by the Contractor's general liability policy, except where such claims, demands and/or suits are due solely to the negligence of the Owner, its Officers, Agents, employees and negligence, errors and/or omissions of the work performed by the Architect/Engineer.

3.5.2.4. include personal & advertising liability.

3.5.2.5 include XCU hazards (Explosion, Collapse, and Underground), as applicable.

3.5.2.6. include Contractor's subcontracted work;

3.5.2.7. include fire damage and medical expenses;

3.5.2.8. remain in effect at least until Final Acceptance and at all times thereafter when Contractor may be correcting, removing or replacing Work; in accordance with section 13.7 and

3.5.2.9. Include Employer's Liability - Stop Gap coverage with a minimum limit of five hundred thousand

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dollars (\$500,000.00) each personal occurrence and five hundred thousand dollars (\$500,000.00) each accident.

3.6 Business Auto Policy

3.6.1 Automobile Liability coverage shall be written to protect the Contractor against all claims for bodily injuries to members of the public and damage to property of others arising from the use of motor vehicles, and shall cover operations on or the site of all motor vehicles, whether they are owned, non-owned or hired.

3.6.2 Unless otherwise stated in the Contract Documents, the liability limits shall not be less than:

3.6.2.1. Bodily Injury: two hundred and fifty thousand dollars (\$250,000.00) each person and five hundred thousand dollars (\$500,000.00) each occurrence.

3.6.2.2. Property Damage: one hundred thousand dollars (\$100,000.00) each occurrence or two hundred and fifty thousand dollars (\$250,000.00) combined single limit for bodily injuries and property damage liability.

3.7 Contract Work-Builders Risk Insurance

3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide a Builder's Risk policy for the amount of coverage set in the Contract Documents. The Builders Risk policy will insure against property damage to the building or structure being constructed or erected during the course of construction.

3.7.1.1. The description of covered property should include all fixtures, materials and supplies to be used in or incidental to, the construction. It should also cover equipment, machinery, materials, etc., not yet installed but destined to become a permanent part of the structure, on the Site or at off Site temporary storage locations.

3.7.1.2. This insurance shall be written under an Inland Marine all risk form, including earthquake, windstorm and flood coverage and shall protect the Contractor, Subcontractors, and the Owner and shall contain a waiver of subrogation clause against the insured parties.

3.7.1.3. Coverage shall be for an amount equal to the Contract Sum, unless otherwise specified in the Contract Documents.

3.7.1.4. Coverage shall include expenses incurred in the repair or replacement of any insured property.

3.7.1.5. Coverage shall include materials and/or equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and/or equipment have been included in an Application for Payment recommended by Owner.

3.7.1.6. Coverage shall allow partial utilization of the Work by Owner, if Owner complies with Article 3.2.7, herein

3.7.1.7. Coverage shall include testing and startup.

3.7.1.8. Coverage shall be maintained in effect until Substantial Completion is achieved unless otherwise agreed to in writing by Owner and Contractor with thirty (30) days written notice to each other additional insured to whom a certificate of insurance has been issued.

3.7.1.9. Unless otherwise stated in the Contract Documents, flood coverage limits shall be for the Contract Sum or up to a maximum of \$250,000.00, whichever is lower.

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3.7.1.10. Deductibles under this Policy shall be no more than:

3.7.1.10.1. Flooding no more than \$5,000.00

3.7.1.10.2. For named windstorms, or hurricanes, no more than two percent (2%) of the Contract Sum.

3.7.1.10.3. For Earthquakes, no more than five percent (5%) of the total Contract Sum.

3.7.2. If the Contract Documents specify that Owner shall purchase the Builders Risk policy, said policy shall be under the same or better terms and conditions, than those indicated in section 3.6. If Contractor requests in writing that other special insurance be included in the property insurance policies provided under this section 3.6, Owner shall, if possible, include such insurance, and the cost thereof will be charged to Contractor by appropriate Change Order or Written Amendment.

3.7.2.1. Unless otherwise provided in the contract Documents, Owner shall be responsible for the deductible under this policy.

3.7.2.2. Prior to commencement of the Work at the Site, Owner shall in writing advise Contractor whether or not such other insurance has been procured by Owner.

3.7.3. The Contract Documents shall set forth, whenever applicable, which party shall purchase and maintain such boiler and machinery insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will insure the interest of Owner, Contractor, and Subcontractors, each of whom is deemed to have an insurable interest and each shall be listed as an insured or additional insured. Unless otherwise set forth in the Contract Documents, said insurance, if needed, shall be purchased and paid for, by the Owner.

3.7.4. Receipt and Application of Insurance Proceeds

3.7.4.1. If Owner purchases said insurance, Owner is authorized and shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing to Owner's exercise of this power within fifteen (15) days after the occurrence of loss.

3.7.4.2. Owner shall settle with the insurers in accordance with what is agreed by the parties who own the insurable interest.

3.7.4.3. If no such agreement among the parties in interest is reached, Owner shall, on behalf of all parties, adjust and settle the loss with the insurers.

3.8 Installation Floater Policy

3.8.1. This policy shall be provided by the Contractor when Builders Risk policy does not apply and coverage is required for only a specific type of property during its installation.

3.8.2. The limit of insurance shall include the aggregate value of the Contractor's, Subcontractor's, or Owner's furnished equipment and materials to be erected or installed by the Contractor.

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3.8.3. This insurance shall be written under an Inland Marine all risk form, including earthquake, windstorm and flood coverage and shall protect the Contractor, Subcontractors, and the Owner and shall contain a waiver of subrogation clause against the insured parties.

3.9 Subcontractor's and Subcontractor's Liability Insurance.

3.9.1. Unless otherwise indicated in the Contract Documents, the Contractor shall, throughout the performance of Work under the Contract, procure and maintain in effect, and require all Subcontractors and others performing any such Work to procure and maintain in effect, insurance of the types applicable and with limits no less than the minimum amounts specified above, or insure the activity of his Subcontractors in his own policy.

3.10 Owner's Liability Insurance.

3.10.1 In addition to the insurance required to be provided by Contractor under Article 3.4, Owner, at Owner's option, may purchase and maintain Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

ARTICLE 4-SITE

4.1 Availability of Lands

4.1.1. Unless otherwise stated in the Contract Documents, Owner shall furnish the Site.

4.1.1.1. Owner shall notify Contractor of any known encumbrances or restrictions specifically related to use of the Site with which Contractor must comply in performing the Work.

4.1.1.2. Owner will obtain in a manner that does not adversely affect the critical path of the Work the easements for permanent structures or permanent changes to existing facilities.

4.1.1.3. If Contractor and Owner are unable to agree on the entitlement to or on the amount of any adjustment in the Contract Price or Contract Time, or both, as a result of any delay in Owner's complying with the responsibilities indicated above, Contractor may make a Claim therefore as provided in section 11.5.

4.1.2. Contractor shall secure and provide all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.2 Subsurface and Physical Conditions

4.2.1. Reports and Drawings. The Supplementary Conditions identify:

4.2.1.1. those reports of explorations and tests of subsurface conditions at or contiguous to the Site that Architect/Engineer has used in preparing the Contract Documents; and

4.2.1.2. those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) that Architect/Engineer has used in preparing the Contract Documents.

4.2.2. Limited Reliance by Contractor on Technical Data Provided. On lineal type projects, Contractor may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are

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not part of the Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data", Contractor may not rely upon or make any Claim against Owner, Architect/Engineer, or any of Architect/Engineer's Consultants with respect to:

4.2.2.1. the completeness of such reports and drawings for Contractor's construction purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or

4.2.2.2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

4.2.2.3. any Contractor interpretation of, or conclusion drawn from, any "technical data" or any such other data, interpretations, opinions, or information.

4.2.3. Reliance by Contractor on Technical Data Provided. On building construction projects, Contractor may rely upon the general accuracy of the "technical data" contained in such reports and drawings, and such reports and drawings are part of the Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data", Contractor may not rely upon or make any Claim against Owner, Architect/Engineer, or any of Architect/Engineer's Consultants with respect to:

4.2.3.1. the completeness of such reports and drawings for Contractor's construction purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or

4.2.3.2. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

4.3 Differing Subsurface or Physical Conditions

4.3.1. Notice: If Contractor believes that any subsurface or physical condition at or contiguous to the Site that is uncovered or revealed either:

4.3.1.1. is of such a nature as to establish that any "technical data" on which Contractor is entitled to rely as provided in section 4.2 is materially inaccurate; or

4.3.1.2. is of such a nature as to require a change in the Contract Documents; or

4.3.1.3. differs materially from that shown or indicated in the Contract Documents; or

4.3.1.4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents; then Contractor, shall promptly, in no event later than 3 working days, after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Article 6.16), notify Owner's Representative, Owner and Architect/Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

4.3.2. Architect/Engineer's and/or Owner's Representative Review. After receipt of written notice as required by the preceding Article, Architect/Engineer and/or Owner's Representative will promptly review the pertinent condition and determine the necessity of Owner's obtaining additional exploration or tests with respect thereto, and advise Owner in writing of Architect/Engineer's and/or Owner's Representative findings and conclusions.

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4.4. Price and Time Adjustments

4.4.1. The Contract Price, or the Contract Time, or both will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor's costs of, or time required for, performance of the Work; subject, however, to the following:

4.4.1.1. such condition must meet any one or more of the categories described in Article 4.3.1; and

4.4.1.2. with respect to Work that is paid for on a Unit Price Basis, any adjustment in Contract Price will be subject to the provisions of section 11.3.

4.4.2 Contractor shall not be entitled to any adjustment in the Contract Price or Contract Time if:

4.4.2.1. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner in respect of Contract Price and Contract Time by the submission of a Bid or by becoming bound under a negotiated contract; or

4.4.2.2. the existence of such condition could reasonably have been discovered or revealed as a result of any visual examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by Contractor prior to Contractor's making such final commitment; or

4.4.2.3. Contractor failed to give the written notice within the time and as required by Article 4.3.1.

→ 4.4.3 If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price, or Contract Time, or both, a Claim may be made therefore as provided in section 11.5.

4.5 Underground Facilities

4.5.1. Shown or Indicated. The information and/or data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner's Representative, Owner or Architect/Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

4.5.1.1. Owner and Architect/Engineer shall be responsible for the reasonable accuracy or completeness of any such information or data; and

4.5.1.2. the costs of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:

4.5.1.2. 1. reviewing and checking all such information and data;

4.5.1.2.2. locating all Underground Facilities shown or indicated in the Contract Documents;

4.5.1.2.3. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction; and

4.5.1.2.4. the safety and protection of all such Underground Facilities and repairing any damage thereto

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resulting from the Work.

4.5.2. Not Shown or Indicated.

4.5.2.1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Article 14.13), notify said findings in writing to the owner of such Underground Facility, Owner's Representative and Architect/Engineer.

4.5.2.2. Architect/Engineer, Owner's Representative and Owner will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility.

4.5.2.3. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

4.5.2.4. If Owner's Representative concludes that a change in the Contract Documents is required, a Work Change Directive, Change Order or Extra Work Order will be issued to reflect and document such consequences.

4.5.2.4.1. An equitable adjustment shall be made to the Contract Price or Contract Time, or both, if warranted under this Article 4.5.

4.5.2.4.2. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Time, Owner or Contractor may make a Claim therefore as provided in section 11.5.

4.6. Reference Points

4.6.1. In projects requiring construction of buildings, at the beginning of the project, the Owner will set construction stakes establishing sufficient property lines, baseline and a bench mark. These stakes and marks will constitute all the surveying work the Owner will provide for the use of the Contractor. From the above-mentioned stakes and marks, the Contractor shall develop and establish all necessary marks and controls to perform his work. The Contractor will be held responsible for the preservation of original stakes and marks provided by the Owner at the beginning of the project, and if any of these stakes or marks are carelessly or willfully destroyed or disturbed by the Contractor, the cost of replacing them will be at Contractor's expense. The Owner will be responsible for the accuracy of the original lines and marks furnished to the Contractor.

4.6.1.1. In lineal projects, Owner shall provide engineering surveys to establish reference points for construction which, in Architect/Engineer's judgment, are necessary to enable Contractor to proceed with the Work.

4.6.2. Contractor shall be responsible thereafter for establishing the reference points and property monuments in accordance with the survey provided by Owner and laying out the Work, shall protect and preserve the reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall be responsible for replacing the established reference points and property monuments, if affected during construction.

4.6.3. Contractor shall report to Owner's Representative and Architect/Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

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4.7. Hazardous Environmental Condition at Site

4.7.1. Reports, Studies and Drawings. Reference is made to the Supplementary Conditions for the identification of those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that have been utilized by the Architect/Engineer in the Preparation of the Contract Documents.

4.7.2. Limited Reliance by Contractor on Technical Data Provided. On lineal type projects, Contractor may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not part of the Contract Documents. Such "technical data" is identified in the Technical Specifications. Except for such reliance on such "technical data", Contractor may not rely upon or make any Claim against Owner, Architect/Engineer, or any of Architect/Engineer's Consultants with respect to:

4.7.2.1. the completeness of such reports and drawings for Contractor's construction purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or

4.7.2.2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

4.7.2.3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

4.7.3. Reliance by Contractor on Technical Specifications Provided. On building construction projects, unless otherwise indicated in the Contract Documents, Contractor may rely upon the general accuracy of the "technical data" contained in such Technical Specifications and/or Plans and Drawings. Except for such reliance on such "technical data", Contractor may not rely upon or make any Claim against Owner, Architect/Engineer, or any of Architect/Engineer's Consultants with respect to:

4.7.3.1. the completeness of such reports and drawings for Contractor's construction purposes, including any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or

4.7.3.2. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

4.7.4. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site that was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work.

4.7.5. Contractor shall be responsible for Hazardous Environmental Conditions created due to any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.

4.7.6. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately:

4.7.6.1. at Owner's cost, secure or otherwise isolate such condition, if it is not the Contractor's fault; or at Contractor's cost, if it is his fault, or anyone for whom Contractor is responsible;

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4.7.6.2. stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by section 6.13 and 14.13); and

4.7.6.3. notify Owner's Representative, Owner and Architect/Engineer and promptly thereafter confirm such notice in writing, no later than 24 hours after the condition has been encountered. Failure to do so shall constitute a waiver of any claim in connection thereto.

4.7.6.3.1. Owner shall promptly consult with Architect/Engineer and/or Owner's Representative concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action.

4.7.7. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner's Representative has obtained any required permits related thereto and delivered to Contractor written notice:

4.7.7.1. specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or

4.7.7.2. specifying any special conditions under which such Work may be resumed safely.

4.7.7.3. If Owner, through Owner's Representative, and Contractor cannot agree as to entitlement to, or on the amount or extent, if any, of any adjustment in Contract Price or Contract Time, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefore as provided in Article 11.5.

4.7.8. If after receipt of such written notice, Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner's Representative may order the portion of the Work that is in the area affected by such condition to be deleted from the Work.

4.7.8.1. If Owner, through Owner's Representative, and Contractor cannot agree as to entitlement to, or on the amount or extent, if any, of an adjustment in Contract Price or Contract Time as a result of deleting such portion of the Work, then either party may make a Claim therefore as provided in Article 11.5.

4.7.8.2. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.

4.7.9. To the fullest extent permitted by Laws or Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and the officers, directors, partners, employees, agents, other consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition:

4.7.9.1. was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and

4.7.9.2. were not created by Contractor or by anyone for whom Contractor is responsible.

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4.7.9.3. Nothing in this Article shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

4.7.10. To the fullest extent permitted by Laws or Regulations, Contractor shall indemnify and hold harmless Owner's Representative, Owner, Architect/Engineer, Architect/Engineer's Consultants, and the officers, directors, partners, employees, agents, other consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible.

4.7.10.1. Nothing in this Article shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

4.7.11. The provisions of sections 4.2, 4.3 and 4.4 are not intended to apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5-OWNER

5.1 General

5.1.1. Owner's responsibilities and obligations are expressed throughout these General Conditions and are not limited to the ones contained in this Article.

5.1.2. All functions of the Owner will be performed by the Contracting Officer, unless delegated to others in the Contract Documents.

5.1.3. The Contracting Officer may delegate his full authority to another person, and to that effect shall notify the Contractor by written communication.

5.1.4. Unless otherwise specified in the Contract Documents, the person signing this Contract shall be interpreted to mean the Contracting Officer.

5.2 Information and Services Required of the Owner

5.2.1. The Owner shall furnish all available information describing the Project including, but not limited to, physical characteristics, legal limits and utility locations for the Project.

5.2.1.1. Said information should have been made available with reasonable time, and, unless otherwise specified in Bid Documents, prior to bid opening.

5.2.2. Before commencement of the Work, as specified in the Notice to Proceed, the Owner shall inform the Contractor in writing the name of the Owner's Infrastructure Area Director, Architect/Engineer, Contracting Officer, Owner's Representative and Project Inspector, if applicable. Owner reserves the right to change, from time to time, the designated persons or entities and any other designated representative who will perform the functions of the Owner. The Notice to Proceed shall also indicate the day of the week on which Contractor and Owner's Representative shall hold their weekly meeting to discuss matters related to the Project. The Owner's Representative may, from time to time, change said date of the week.

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5.2.3 Furnishing of Right of Way - The Owner will be responsible for obtaining the necessary rights-of-way in advance of construction. Any exceptions will be indicated in the Contract Documents.

5.2.4 Information or services to be provided by Owner shall be furnished by the Owner with reasonable promptness so as to avoid any delay in the orderly programmed progress of the Work.

5.3 Pay Promptly When Due

5.3.1. Owner shall make payments to Contractor promptly when they are due.

5.4 Owner's Right to Stop the Work

5.4.1. The Owner's Representative and/or Owner may in accordance with Article 15.1.2 order the Contractor to stop the Work, or any portion thereof if the Contractor:

5.4.1.1. fails to start (and expeditiously continues) correcting defective work promptly after Contractor is notified in writing by the Owner;

5.4.1.2. persistently fails to supply materials or equipment in accordance with the Contract Documents; or

5.4.1.3. for any other significant reason deemed necessary to insure the proper execution of the Contract until the cause for such order has been eliminated.

5.5 Owner's Right to Carry Out the Work Without Terminating the Employment of the Contractor

5.5.1. If the Contractor persistently neglects to carry out the Work in accordance with the Contract Documents or persistently fails to comply with any provision of the Contract, the Owner, through the Owner's Representative, may, after ten (10) days written notice to the Contractor and Surety, if any, and without prejudice to any other remedy he may have, perform said Work and/or, remedy such deficiencies.

5.5.1.1. In such case, an appropriate deduction for the cost of performing said Work and/or correcting such deficiencies shall be made from the payments then, or thereafter, due the Contractor. If the payments then, or thereafter, due the Contractor are not sufficient to cover such amount, the Contractor and/or surety shall pay the difference to the Owner.

5.5.2. The cost to be charged to Contractor of such Work, repairs or replacement, will be the actual cost incurred by Owner.

5.6 Owner's Right to Clean Up

5.6.1. If a dispute arises between the separate contractors in the Project as to their responsibility for cleaning up as required by these General Conditions, the Owner may, after written notice to Contractor, clean up and charge the cost thereof to the several contractors in the proportion that the Architect/Engineer, or the Owner's Representative, determines equitable. If the Contractor is not in agreement with the cost distribution, he may make a claim as provided in Article 11.5.

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5.7 Evidence of Financial Arrangements

5.7.1. Upon Contractor's request, Owner will furnish Contractor reasonable evidence that financial arrangements have been made for the payment of Owners' obligations under the Contract, and that all documentation for said purpose has been filed pursuant to applicable Laws and Regulations.

5.7.1.1. If requested in writing by Contractor, Owner shall supply reasonable written evidence that Owner has complied with these requirements.

5.8 Limitations on Owner's Responsibilities

5.8.1. Unless otherwise provided in the Contract Documents the Owner, through Owner's Representative, shall have no authority over, nor responsibility for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or shall not be held responsible for any failure of Contractor to comply with Laws or Regulations applicable to the performance of the Work. Owner's Representative, or Owner, will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

ARTICLE 6 - CONTRACTOR

6.1 Supervision and Superintendence

6.1.1. Contractor shall supervise and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents.

6.1.1.1. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction, but Contractor shall not be responsible for the negligence of Owner or Architect/Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction, which is shown or indicated in and expressly required by the Contract Documents.

6.1.1.1.1. When the Contract Documents specify the use of a specific means, method, technique, sequence, or procedure of construction, which is shown or indicated in and expressly required by the Contract Document, such means, method, technique, sequence, or procedure of construction shall be used unless others are authorized by the Owner's Representative.

6.1.1.1.2. If the Contractor desires to use a means, method, technique, sequence, or procedure of construction other than specified in the Contract Documents, he shall request authority from the Owner's Representative to do so.

6.1.1.1.2.1. The request shall be in writing and shall include a description of the methods and equipment proposed and of the reasons for desiring to make the change.

6.1.1.1.2.2. If approval is given, it will be on the condition that the Contractor will be fully responsible for producing work in conformity with the Contract Documents.

6.1.1.1.2.3. If, after trial use of the substituted methods or equipment, the Owner's Representative determines that the Work produced does not meet Contract requirements, the Contractor shall discontinue the use of the substitute method or equipment and shall complete the remaining Work with the specified methods and

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equipment.

6.1.1.1.2.4. The Contractor shall remove the deficient Work and replace it with Work of specified quality, or take such other corrective action as the Owner's Representative may direct.

6.1.1.1.2.5. No change will be made in the Contract amount for the construction items involved or in Contract Time as a result of authorizing a change in methods or equipment under these provisions.

6.1.1.1.3. Contractor shall be responsible to ascertain that the completed Work complies accurately with the Contract Documents.

6.1.2. Project Manager. Unless otherwise indicated in the Contract Documents, the Contractor shall employ a competent licensed and collegiate architect or engineer, as the Project Manager, and necessary assistants to direct the Work. These assistants shall be in attendance at the project site at all times during the prosecution of the Work. The Project Manager shall be satisfactory to the Owner or his representatives and shall not be changed except with the consent of the Owner, unless the Project Manager proves to be unsatisfactory to the Contractor (and Contractor gives Owner written notice of the specific reason for removal as Project Manager) or ceases to be in Contractor's employ.

6.1.2.1. The Project Manager will be Contractor's representative at the Site and shall have authority to act on behalf of Contractor. The Contractor, prior to the start of the Project, will inform the Owner's Representative, if already assigned, or the Owner, if not assigned, the name, authority and responsibilities of the Project Manager and/or Superintendent.

6.1.2.1.1. All communications given or received from the Project Manager shall be binding on Contractor. All communications related to the Contract directed to the Contractor and/or proceeding from the Owner, Architect/Engineer, Owner's Representative and other representatives of the Owner shall be made thru the Project Manager.

6.2 Labor and Working Hours

6.2.1. Contractor shall provide competent, suitably qualified personnel to survey, layout, and construct the Work as required by the Contract Documents.

6.2.1.1. The Contractor shall at all times enforce strict discipline and good order among his employees and shall not employ in relation to the Project or the Work any unfit person or anyone not skilled in the task assigned to him.

6.2.1.1.1. The Contractor shall be responsible to the Owner for the acts and omissions of all of his employees and all subcontractors, their agents and employees and all other persons performing any work under a contract with the Contractor.

6.2.1.2. The Contractor shall, at all times, employ sufficient labor and equipment for prosecuting the Work to full completion in the manner and within the time required in the Contract Documents.

6.2.1.2.1. Workers engaged in special work or skilled work shall have sufficient experience in the performance of such work and in the operation of the equipment and tools to perform it properly and satisfactorily.

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6.2.1.2.2. Any person employed by the Contractor or by a subcontractor who, as determined by the Owner's Representative, does not perform his work in a proper and skillful manner, or is disrespectful, intemperate, disorderly or otherwise objectionable shall, at the written request of the Owner's Representative, be removed forthwith by the Contractor or Subcontractor employing such employee, and such person shall not be employed again on any portion of the Work without the written consent of the Owner's Representative. Owner's Representative shall specify, in writing, the reason for the removal of such person from the jobsite.

6.2.1.2.2.1. Should the Contractor fail to remove such person or persons as required herein, the Owner may withhold payment of estimates which are or may become due, or may suspend the Work by written notice until such orders are complied with.

6.2.2. Except as otherwise required for the safety or protection of persons or the Work or property at the Site, or adjacent thereto, or for completion of daily Work as provided in Article 9.1.2.2.2. or as otherwise stated in the Contract Documents, all Work shall be performed during regular working hours and Contractor will not permit overtime work or the performance of Work on Saturday, Sunday, or any legal holiday without Owner's Representative's written consent (which will not be unreasonably withheld).

6.2.2.1. The Contractor shall comply with all the applicable Federal and Commonwealth laws, rules and regulations concerning fair labor practices including minimum wages, work hours, equal employment opportunities, non-discrimination, civil rights, employment of minors, and other labor relation matters.

6.2.2.2. The Contractor shall pay weekly, in lawful money of the United States of America, including payment by check or direct deposit, the entire amount of wages, less legally authorized or mandated deductions, earned by each of the laborers and employees engaged in the work.

6.2.2.2.1. The Contractor shall make available the Project payrolls to the Owner's Representative for inspection and shall submit copies of such payrolls to the Owner's Representative when required.

6.2.2.2.1.1. Any irregularities noted in the Project's payrolls will be brought to the attention of the Contractor by the Owner's Representative for appropriate corrective action and payment of any pending wages. Should the Contractor fail to take the necessary action, he will be subject to such civil and criminal proceedings as provided by law and regulations.

6.2.2.2.1.2. Payment of wages to laborers and employees of the Contractor for their work shall have preference over the payment of other debts of the Contractor, except as otherwise established by law.

6.3 Services, Materials, and Equipment

6.3.1. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.

6.3.2. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents.

6.3.2.1. All warranties and guarantees required by the Contract Documents shall expressly benefit Owner.

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6.3.2.2. If required by Owner's Representative, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

6.3.2.3. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise provided in the Contract Documents.

6.4 Progress and Other Schedules

6.4.1. Measurement and payment.

6.4.1.1. Unless otherwise specified in the Contract Documents, all costs in connection with the preparation and maintenance of schedules, workplans, submittals and other work specified in this Article 6.4 are to be included and form part of the project's general administrative expenses. Contractor's Cost for said work required in Article 6.4 shall not be paid as a separate pay item in Unit Price contracts or as a Schedule of Values item, in Lump Sum contracts.

6.4.2. General.

6.4.2.1. Progress schedules shall represent a practical plan to complete the Work within the Contract Time, and shall convey the Contractor's intent as to the manner of prosecuting the progress of the Work.

6.4.2.2. The scheduling and execution of construction in accordance with the Contract Documents are the responsibility of the Contractor. The Contractor shall involve and coordinate all Subcontractors and Suppliers in the development and updating of progress schedules.

6.4.2.3. The submittal of progress schedules shall be understood to be the Contractor's representation that the progress schedule meets the requirements of the Contract Documents and that the Work is expected to be executed in the sequence and duration indicated in the progress schedule.

6.4.3. Scheduling format.

6.4.3.1. The Project Schedule shall be computer produced using the Critical Path Method ("CPM") format. The schedule shall be computer generated utilizing an Owner approved project scheduling software, as indicated in the Contract Documents, such as Primavera, Microsoft Project, or SureTrak. The project scheduling software selected shall be used consistently from commencement to Final Acceptance of the Project. If the Contractor desires to use a project scheduling software other than the one specified in the Contract Documents, he shall request authorization from the Owner's Representative to do so, prior to the issuance of the Notice to Proceed. If the Contract Documents do not indicate a specific scheduling program, the Contractor may use any of the three mentioned herein, at his sole option.

6.4.3.2. The Project Schedule shall be updated monthly and submitted as indicated in Article 6.4.4. .

6.4.3.3. The schedule shall show Contract tasks, percent complete, progress bars, baseline schedules, milestones, start and finish dates, and other breakdowns as required by the Owner's Representative. The schedules shall show clearly the sequence of activities and shall list specifically the following activities:

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6.4.3.3.1. interim milestones completion dates. Phasing and staging of the Work as specified shall be prominently identified;

6.4.3.3.2. submittals and the Owner's Representative review of submittals;

6.4.3.3.3. acquisition of permits;

6.4.3.3.4. any long lead time (over 60 days) orders for material and equipment;

6.4.3.3.5. work to be performed by other contractors and agencies;

6.4.3.3.6. delivery of Owner's furnished equipment and materials indicated for incorporation in the Work.

6.4.3.4. Descriptions of scheduled activities shall include sufficient detail to identify the work that is to be accomplished.

6.4.3.4.1. The schedule shall contain sufficient activities to clearly show the sequence and interdependencies of the Work. The Owner's Representative may request that additional activities and information be added and from time to time may also require reasonable amendments to the schedule format that result in more clarity as to how the information is presented.

6.4.3.4.2. Activity durations shall be expressed in whole days. Work that is to be performed by Subcontractor shall be clearly defined.

6.4.3.4.3. Critical path activities are those activities with a total float equal to or less than zero. Schedules with negative total float may be found to be impractical by the Owner's Representative.

6.4.3.4.4. A schedule showing that Work that is completed in less than the completion time specified, shall be considered to have float. The float shall be the time between the scheduled completion of the Work and the Contract completion date. Float time shall not be for the exclusive benefit of either the Owner or the Contractor. Float shall be a resource available to both parties.

6.4.3.4.4.1. If according to the critical path of the originally approved Project Schedule any party that generates a float in said critical path, then said float shall belong exclusively to the party generating said float.

6.4.3.4.5. A schedule found to be impractical for the preceding reasons or any other reasons shall be revised by the Contractor and resubmitted.

6.4.4 Submittals.

6.4.4.1. Within thirty (30) days after the effective date of the Notice to Proceed (unless otherwise specified in the Contract Documents), Contractor shall submit to Owner's Representative for its timely review:

6.4.4.1.1. a preliminary progress schedule indicating the times (numbers and days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;

6.4.4.1.2. a preliminary schedule of Shop Drawings and Sample submittals which will list each required submittal and the times for submitting, reviewing, and processing such submittal; and

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6.4.4.1.3. a preliminary schedule of values for all of the Work, as specified on Article 13, herein.

6.4.4.2. Submit one (1) electronic copy and the number of hard copies of the Submittals required in Article 6.4 which the Contractor requires to be returned, plus three (3) hard copies which will be retained by the Owner.

6.4.4.3. Schedule submittals will be reviewed by the Owner's Representative, and shall be updated and revised as indicated in section 6.4.6. Re-submittals shall conform to the same requirements as original submittals.

6.4.4.4. The Contractor shall prepare and submit all schedules and schedule analysis reports in electronic as well as hard copies.

6.4.4.5. All progress schedule submittals are subject to review and approval by the Owner's Representative.

6.4.4.5.1. Unless otherwise provided in the Contract Documents, at least ten (10) days before submission of the Application for Payment, a conference, to be attended by Contractor, Owner's Representative, Architect/Engineer, and others as appropriate, will be held to review for purposes of acceptability to Owner's Representative, as provided below, the progress schedules submitted in accordance to Article 6.4.4.1. If said meeting is not held, for reasons other than due to the fault of the Contractor, or if the Owner's Representative does not provide timely approval, or corrections, to the submitted submittals specified in Article 6.4.1., all the previously submitted submittals shall be considered approved, provided Contractor has given notice directly to Owner as required in Article 17.3.2.

6.4.4.5.1.1. Contractor shall have an additional ten (10) days to make corrections and adjustments and to complete and resubmit the schedules. Owner's Representative shall approve said corrections within a period of ten (10) days from the date of re-submittal otherwise they shall be considered approved, provided Contractor has given notice directly to Owner as required in Article 17.3.2.

6.4.4.5.1.1.1. The third progress payment shall not be paid to Contractor until acceptable schedules are submitted to Owner's Representative, or until schedules are considered approved as specified herein.

6.4.4.5.1.1.2. The Progress Schedule will be acceptable to Owner's Representative if in accordance with the Agreement it provides an orderly progression of the Work to completion within any specified Milestones and the Contract Time.

6.4.4.5.1.1.3. Contractor's schedule of Shop Drawings and Sample submittals will be acceptable to Owner's Representative if it provides, in Owner's sole discretion, a workable arrangement for reviewing and processing the required submittals.

6.4.4.6. The first schedule submitted by the Contractor will be reviewed for format, as well as content. The Owner's Representative may request format changes. Once the format has been approved, all subsequent schedules shall be submitted in the approved format.

6.4.5 Four-week work plan.

6.4.5.1. A schedule in calendar time-scaled bar chart format depicting the Contractor's intended work activities for the upcoming four (4) week period shall be submitted on a monthly basis and shall be due on the day of the project's weekly meeting. Each activity of one (1) day or more in duration shall be indicated.

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6.4.5.2. Any deviations, such as sequences of work, timing, and durations of activities from the approved Project Schedule, shall be noted and explained in writing.

6.4.5.3. The four (4) week work plan shall be submitted on sheets not less than 8 ½ inches by 11 inches, or as approved by the Owner's Representative.

6.4.6. Review, updates and revisions

6.4.6.1. The Owner's Representative will review and return to Contractor the schedule submittals, with written comments, within the following deadlines counted from the date of receipt.

6.4.6.1.1. Project CPM schedule: 14 calendar days.

6.4.6.1.2. Four (4) week work plan: 8 calendar days.

6.4.6.2. The Contractor shall make all corrections to the Project Schedule requested by the Owner's Representative and resubmit the schedule for approval. If the Contractor does not agree with the Owner's Representative's comments, the Contractor shall provide written notice of disagreement within five (5) days from the receipt of the Owner's Representative's comments. The Owner's Representative's comments on the four (4) week work plan for which the Contractor disagrees shall be resolved in a meeting held for that purpose, if necessary.

6.4.6.3. At least once each month, or often if indicated in the Contract Documents, the Contractor shall submit an updated schedule showing the progress of the Work to date and anticipated activities to be worked on. All updated schedules must comply with Article 6.4.

6.4.6.4. If, according to the approved Project Schedule, the Contractor is thirty (30) or more days behind as to the completion date of any milestone, or the schedule contains thirty (30) or more days of negative float, considering all approved time extensions, the Contractor shall submit a revised schedule, showing a practical plan to complete the Work within the Contract Time.

6.5 Submittals for Approval, Substitutes and/or "Equals"

6.5.1. Submittal for Approval of Materials, Shop Drawings and Samples; Plans and Working Drawings; As-Built Plans.

6.5.1.1. The Contractor shall submit all submittals for approvals of Materials, Shop Drawings and Samples to the Owner's Representative. The Owner's Representative will either perform the review and approval, or forward the Contractor's submittal to the Architect/Engineer's for his review and approval, in accordance with the accepted itinerary for Shop Drawings and Sample submittals.

6.5.1.2. All submittals will be identified as required by Owner's Representative and presented with the number of copies specified in the Contract Documents. If a number is not mentioned, seven (7) copies will be submitted. Of these seven (7) copies, four (4) shall be returned, duly evaluated, to the Contractor.

6.5.1.3. The data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Owner's Representative the services, materials, and equipment Contractor proposes to provide and to enable Owner's Representative to review the

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information for the limited purposes of complying with the requirements of Article 6.17.

6.5.1.4. The Architect/Engineer or the Owner's Representative shall have the following deadlines within which to approve, request additional information or reject any Submittal for Approval of Materials, Shop Drawings and Samples:

6.5.1.4.1. For Materials, Shop Drawings or Samples which are the ones specified in the Contract Documents or are, in the opinion of the Owner's Representative, non-complex Shop Drawings or Materials, the Architect/Engineer or Owner's Representative shall have a period of ten (10) working days.

6.5.1.4.2. For Materials, Shop Drawings or Samples not complying with the requirements indicated in the previous Article, the period shall be twenty (20) working days.

6.5.1.4.3. If no comment by the Architect/Engineer or Owner's Representative is made within said period of time, the Contractor will have the right to Claim if said delay impacts the critical path.

6.5.1.4.4. The above mentioned deadlines can be extended if requested in writing by the Architect/Engineer and/or Owner's Representative as long as approval is made within a time period that does not alter the critical path. Such request for extension shall not be unreasonably denied.

6.5.1.5. Each Sample will be identified clearly as to material, supplier, pertinent data such as catalog numbers, and the use for which it is intended or otherwise as Owner's Representative may require, to enable the Architect/Engineer or the Owner's Representative to review the submittal for the limited purposes of complying with the requirements of Article 6.17.

6.5.1.5.1. The numbers of items each Sample to be submitted will be as specified in the Specifications. If no number of items is mentioned, three (3) samples will be submitted. Of these, three (3) samples, two (2) shall be returned, duly evaluated, to the Contractor.

6.5.2. Where an approval of Materials, Shop Drawing or Samples is required by the Contract Documents or the schedule of Shop Drawings and Sample submittals, any related Work performed, including materials purchases, prior to Owner's Representative or Architect/Engineer's review and approval of the pertinent submittal will be at the sole responsibility of Contractor.

6.5.3. Submittal Procedures.

6.5.3.1. Before delivering each submittal for approvals of Material, Shop Drawing or Sample, Contractor shall have:

6.5.3.1.1. verified that all shop drawing measurements, quantities, shop drawing dimensions, specified performance criteria, installation requirements, materials, catalog numbers, and similar information are in accordance with the Contract Documents and if not in accordance, ascertained that all variations are indicated in the submittal;

6.5.3.1.2. verified all materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work;

6.5.3.1.3. verified all information relative to means, methods, techniques, sequences, and procedures of construction and safety precautions and programs incident thereto; and

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6.5.3.1.4. Contractor shall also have reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings or Samples and with the requirements of the Work and the Contract Documents.

6.5.3.2. Each submittal shall bear a stamp or specific written indication that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal. If required in the Special Conditions, submittals for Materials and Samples must bear a notarized certificate of compliance.

6.5.3.3. At the time of each submittal, Contractor shall give Owner's Representative specific written notice of such variations, if any, that the submittal for approvals of material, Shop Drawing or Sample submitted may have from the requirements of the Contract Documents, such notice to be in a written communication included with the submittal.

6.5.4. The Architect/Engineer or Owner's Representative's Review.

6.5.4.1. Owner's Representative, either himself or through the Architect/Engineer, will perform a timely review, evaluation and comment of Shop Drawings and Samples in accordance with the schedule of Shop Drawings and Sample submittals acceptable to Owner's Representative. If no comment by the Owner's Representative is made within the time stated in this Article 6.5 the Contractor will have the right to claim pursuant the provisions of Article 11.5, if said delay impacts the critical path.

6.5.4.1.1. The Architect/Engineer or the Owner's Representative review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

6.5.4.1.2. The Architect/Engineer or the Owner's Representative's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto.

6.5.4.1.2.1. The review and approval of a separate item, as such, will not indicate approval of the assembly in which the item functions.

6.5.4.1.3. The Architect/Engineer or the Owner's Representative's review and approval of Shop Drawings or Samples shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has in writing called the Architect/Engineer or the Owner's Representative attention to each such variation at the time of each submittal as required by Article 6.17 and the Architect/Engineer or the Owner's Representative has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample approval; nor will any approval by the Architect/Engineer or the Owner's Representative relieve Contractor from responsibility for complying with the requirements of Article 6.17.

6.5.5. Re-submittal Procedures.

6.5.5.1. Contractor shall make corrections required by the Architect/Engineer or the Owner's Representative and shall return the required copies of materials submittals, the required number of corrected copies of Shop Drawings and submit as required new Samples for review and approval.

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6.5.6 Substitutes and "Or-equals".

6.5.6.1. Whenever an item or material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Owner's Representative for review under the circumstances described below. The Contractor will present his submittal for approval, indicating whether the item of material or equipment proposed is an Or Equal or a Substitute.

6.5.6.2. "Or-Equal" Items: If in Owner's Representative's sole discretion an item, or material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it will be considered by Owner's Representative as an "or-equal" item, in which case review and approval of the proposed item be accomplished without compliance with the special requirements for approval of the proposed substitute items and be acceptable or acceptable with comments. Owner's Representative's basis for rejection of the item of material or equipment as an "or equal" material shall be written and may be subject to appeal, as specified in Article 11.5 of these General Conditions, by Contractor. For the purposes of this Article, a proposed item of material or equipment will be considered functionally equal to an item so named if:

6.5.6.2.1. In the exercise of reasonable judgment, Owner's Representative determines that:

6.5.6.2.1.1. it is at least equal in quality, durability, appearance, strength, and design characteristics;

6.5.6.2.1.2. it will reliably perform at least equally well the function imposed by the design concept of the completed Project as a functioning whole, and;

6.5.6.2.2. Contractor certifies that:

6.5.6.2.2.1. there is no increase in cost to the Owner; and

6.5.6.2.2.2. it will conform substantially, even with deviations, to the detailed requirements of the item named in the Contract Documents.

6.5.6.2.2.3. Owner's Representative shall make the decision on the "or equal" material with sufficient time so as not to alter the Contractor's Programmed Schedule of the Work. If no comment by the Owner's Representative is made within said period of time, the Contractor will have the right to Claim pursuant the provisions of Article 11.5 if said delay impacts the critical path.

6.5.6.3. Substitute Items

6.5.6.3.1. If in Owner's Representative's sole discretion an item or material or equipment proposed by Contractor does not qualify as an "or-equal" item under Article 6.5.6, it will be considered a proposed substitute item.

6.5.6.3.2. Contractor shall submit sufficient information as provided below to allow Owner's Representative to determine that the item or material or equipment proposed is essentially equivalent to that specified and an acceptable substitute therefore.

6.5.6.3.2.1. Requests for review of proposed substitute items, material or equipment will not be accepted by

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Owner's Representative from anyone other than Contractor.

6.5.6.3.3. The procedure for review by Owner's Representative will be as set forth in Article 6.5.6, as supplemented in these General Conditions and as Owner's Representative may decide is appropriate under the circumstances.

6.5.6.3.4. Contractor shall first make written application to Owner's Representative for review of a proposed substitute item, material or equipment that Contractor seeks to furnish or use.

6.5.6.3.4.1. The application shall certify that the proposed substitute item will perform adequately the functions and achieve the results called for by the general design, be similar in substance to that specified, and be suited to the same use as that specified.

6.5.6.3.4.2. The application will state the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's timely achievement of Substantial Completion, whether or not use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for work on the Project) to adapt the design to the proposed substitute item and whether or not incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.

6.5.6.3.4.3. All variations of the proposed substitute item from that specified will be identified in the application, and available engineering, sales, maintenance, repair, and replacement services will be indicated.

6.5.6.3.4.4. The application will also contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change, all of which will be considered by Owner's Representative in the evaluation of the proposed substitute item.

6.5.6.3.4.5. Owner's Representative may require Contractor to furnish additional data about the proposed substitute item.

6.5.6.3.5. Owner's Representative shall make the decision on the "substitute" material with sufficient time so as not to alter the critical path. If no comment by the Owner's Representative is made within said period of time, the Contractor will have the right to Claim pursuant the provisions of Article 11.5 if said delay impacts the critical path.

6.5.6.3.6. Owner's Representative's basis for rejection of a "substitute" material shall be written and may be subject to appeal and Claim by Contractor, as specified in Article 11.5.

6.5.6.4. If a Substitute item is approved by the Owner and such change affects the Contract Price, then the Contract Price shall be equitably adjusted.

6.5.7. Substitute Construction Methods or Procedures.

6.5.7.1. If a specific means, method, technique, sequence, or procedure of construction is shown, or indicated in, or expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Owner's Representative.

6.5.7.1.1. Contractor shall submit sufficient information to allow Owner's Representative, in Owner's

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Representative's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. Such submittal shall be made with sufficient time as to allow the Owner's Representative to review it.

6.5.7.1.1.1. The procedure for review by Owner's Representative will be similar to that provided in section 6.5.6 but no Claim may be made by contractor due to untimely evaluation by Owner.

6.5.8. Owner's Representative's Evaluation.

6.5.8.1. Owner's Representative or Architect/Engineer will be allowed a reasonable time, which will not unreasonably delay the critical path of the Work, within which to evaluate each proposal or submittal made pursuant to Article 6.5.

6.5.8.2. Except as provided above. Owner's Representative will be the sole judge of acceptability.

6.5.8.3. No "or-equal" or substitute will be ordered, installed or utilized until Owner's Representative's review is complete, which will be evidenced by written approval by Owner for a substitute or an approved Shop Drawing or an "or-equal."

6.5.8.4. Owner's Representative will advise Contractor in writing of any negative determination.

6.5.8.5. Owner's Representative will charge Contractor for any overtime expenses and other costs incurred in the evaluation of a proposed substitute, similar, or equal materials, unless said proposal was submitted by Contractor with reasonable time as to afford the Owner the time necessary to analyze the submittal without affecting the Project Schedule.

6.5.9. Special Guarantee.

6.5.9.1. Owner's Representative may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

6.5.10. Contractor's Expense.

6.5.10.1. Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

6.5.11. Approval of Submittals.

6.5.11.1. If within the periods of time provided under this Article 6 for approval of submittals made by the Contractor, the Owner's Representative fails to render his decision as to any submittal and the critical path is adversely affected, the Contractor shall require in writing the approval of the Owner's Representative, who shall have ten (10) working days to issue his decision. If no decision is forthcoming from the Owner's Representative within the stated time, for reasons other than due to the fault of Contractor, the submittal shall be considered approved, provided Contractor has also given the same timely notice directly to Owner required in Article 17.3.2

6.6 Review of Contract Documents

6.6.1. The Contractor shall carefully study and compare the Contract Documents with each other and with

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information furnished by the Owner and shall at once report to the Owner, Architect/Engineer, and Owner's Representative any error, inconsistency or omission he may discover.

6.6.1.1. The Contractor shall not be liable to the Owner for any errors, inconsistencies or omissions in the Contract Documents.

6.6.1.2. The Contractor shall not take advantage of any such errors, inconsistencies, or omissions.

6.6.1.3. The Owner's Representative after being notified by the Contractor of such errors, inconsistencies or omissions will make the corrections and interpretations deemed necessary for fulfilling the intent of the Contract Documents, within a reasonable time so as not to alter the programmed progress of the Work. If no comment by the Owner's Representative is made within said time the Contractor will have the right to Claim pursuant the provisions of Article 11.5 if said delay impacts the critical path.

6.7 Patent, Fees and Royalties

6.7.1. Contractor shall pay all license fees and royalties and assume all costs incident to the use, in the performance of the Work or the incorporation in the Work, of any invention, design, process, product, or device which is the subject or patent rights or copyrights held by others.

6.7.2. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of Owner or Architect/Engineer its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.

2 6.7.3 To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner, Architect/Engineer, Architect/Engineer's Consultants, and the officers, directors, partners, employees or agents, and other consultants of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

6.8 Permits

6.8.1. Unless otherwise indicated in the Contract Documents, the responsibilities for securing and paying for permits, governmental fees and licenses for work to be performed are as follows:

6.8.1.1. To obtain the Construction Permit, the Contractor shall pay the premiums to secure the State insurance Fund policy and the Municipal Construction Taxes, at the rate that is in effect at bid date, unless the Contractor is explicitly not obligated to pay said taxes under the terms and provisions of the Contract Documents, in which case, shall so be specifically stated in the Contract Documents. The Owner shall secure all the Architect or Engineer's and Owner's Representative's certificates necessary and pertinent needed to secure the Construction Permit as well as submit applications and secure the permits for the Plan CES and for the Federal Storm Water Drainage plan, if same is required for the Project.

6.8.1.2. To obtain the Use Permit, the Contractor shall secure the endorsements required for said Use Permit from all government agencies, unless one or more of these cannot be obtained due to circumstances beyond the control of the

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Contractor. The Owner must ascertain that the reports required for the Use Permit from the Architect or Engineer and Owner's Representative are duly filed with "Oficina de Gerencia de Permisos" and must also obtain any of the above mentioned endorsements that cannot be obtained due to circumstances beyond the control of Contractor.

6.8.1.3. All payments due, or to become due, to any agency, public or private, for connection to, or improvement of any of said agencies' infrastructure (Impact Fees) shall be paid by the Owner with sufficient time so as not to adversely affect the critical path of the Work.

6.8.1.4. The Contractor shall secure and pay for all incidental permits required for the completion of the Work, unless such incidental permits deviate from the normal procedures, or costs, of the requiring agency and shall do so in a timely manner so as not to adversely affect the critical path of the Work.

6.8.1.5. Any other fees or charges related to permitting to be paid by the Contractor will be indicated in the special conditions.

6.8.1.6. The duties of Owner and of Contractor stated in this Article 6.8 shall be performed in a timely manner as to not adversely affect the critical path of the Work.

6.9 Laws and Regulations

6.9.1. Contractor shall give all notices and comply with all Laws and Regulations applicable to the performance of the Work.

6.9.1.1. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner, nor Owner's Representative nor Architect/Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

6.9.1.2. Should the Contractor observe that the Contract Documents are at variance with any Federal, Commonwealth and Municipal laws, ordinances, rules, regulations, by-laws, and all orders or decrees, he shall promptly notify the Owner's Representative in writing and the Owner's Representative shall instruct the Contractor, also in writing, as to how Contractor is to proceed. Any additional cost and /or extra time incurred by the Contractor to comply with Laws and Regulations enacted after the bid opening date, it may file a claim for equitable adjustment of the Contract Price or the Contract Time or both, as shall any decrease in cost or time resulting therefrom.

6.9.1.3. If the Contractor performs any work knowing it to be contrary to Federal, Commonwealth and Municipal laws, ordinances, rules, regulations, by-laws, orders or decrees, the Contractor shall assume full responsibility therefore, and shall bear all cost arising there from.

6.9.1.4. The Contractor shall save the Owner and its authorized representatives harmless from any claim or liability arising from or based on the infraction or violation of any such laws, ordinances, rules, regulations, by-laws, all orders or decrees, except if the infractions or violations are caused by acts of the Owner, or of Owner's authorized representatives.

6.9.1.5. If Contractor performs any Work knowing or having reason to know that he is acting contrary to said Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred as a consequence thereof. It shall not be Contractor's primary responsibility to make certain

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that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not release Contractor of Contractor's obligations hereunder.

6.10 Taxes

6.10.1. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work and which were in effect at the bid opening date.

6.10.1.1. Among said taxes, the Contractor shall pay the municipal construction taxes applicable to the Project in a timely fashion, but no later than fifteen (15) calendar days after the first partial (certification) payment is made by the Owner to Contractor.

6.10.1.2. If specifically stated in the Contract Documents, the Municipal Construction tax rate may be determined between Owner and the municipal government where the project is to be located, in such case a specific rate shall be established by the mayor and the municipal legislature, and notified to the Contractor before bid time. If no such rate is indicated in the Contract Documents regarding such arrangement between Owner and the municipal government, then the Contractor shall pay at the rates prevailing at the time of the bid.

6.10.1.1.1. The Contractor shall furnish and deliver to the Owner written evidence that said payment(s) was made before the second partial (certification) payment is made by the Owner to Contractor.

6.10.1.1.2. In case that the Contractor does not furnish and deliver said evidence of payment, the Owner shall deduct from said partial (certification) payments the undisputed amount of municipal tax plus any penalties and fines and pay it directly to the municipality.

6.10.1.1.2.1. If the amount of the second partial (certification) payment is not enough to cover the total amount of the municipal tax, the Owner shall continue to deduct from the following partial (certification) payments until the undisputed amount is paid in full.

6.10.1.1.2.2. The direct payment provided for in Article 6.10.1.1.2 shall be effected after the retainage required in Article 13.2.2 is deducted.

6.11 Use of Site and Other Areas

6.11.1. Limitation on Use of Site and Other Areas.

6.11.1.1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment.

6.11.1.1.1. Contractor shall assume full responsibility for any damage to any such land or area, or to the Owner or occupant thereof, or of any adjacent land or areas, resulting from the performance of the Work.

6.11.1.1.2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly resolve the dispute with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.

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6.11.1.1.3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold Owner, Architect/Engineer, Architect/Engineer's Consultant, and the officers, directors, partners, employees, agents, and other consultants of each and any of them harmless from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Architect/Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.

6.11.2. Removal of Debris during Performance of the Work.

6.11.2.1. During the progress of the Work, Contractor shall keep the Site and other areas free from excessive accumulations of waste materials, rubbish, and other debris caused by his operations on the Site.

6.11.2.1.1. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

6.11.3. Cleaning.

6.11.3.1. Prior to Substantial Completion of the Work Contractor shall clean the Site and make it ready for utilization by Owner.

6.11.3.1.1. At the completion of the Work Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

6.11.3.1.1.1. If the Contractor fails to clean up as indicated above, the Owner may do so and the cost thereof shall be charged to the Contractor.

6.11.4. Loading Structures.

6.11.4.1. Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.11.4.2. Owner's Representative shall not permit any of the Owner's Other Contractors, his personnel, or any other entity performing work for him directly at the Site, to load any part of any structure in any manner that will endanger the structure, nor shall Owner's Representative subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.11.5. Rights To and Use of Materials Found On the Work.

6.11.5.1. The Contractor, with the prior written approval of the Owner's Representative, may use to perform the Work materials obtained from existing structures at the Site which are to be removed that are determined by the Owner's Representative to be acceptable for a use approved in writing by Owner's Representative.

6.11.5.2. Unless otherwise provided in the Contract Documents, material from any existing structures to be removed may be used temporarily by the Contractor in the erection of new structures.

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6.11.5.2.1. If the material is to be salvaged for the Owner, its modification will not be permitted except as approved by the Owner's Representative.

6.11.5.2.2. Unless otherwise specified in the Contract Documents, all soil existing at the Project Site will be considered fit to be used as fill in the performance of the Work if such soil meets the Project's field fill criteria.

6.12 Record Document

6.12.1. Contractor shall maintain in a safe place at the Site one (1) record copy of all Drawings, Specifications, Addenda, Written Amendments, Change Orders, Extra Work Orders, Work Change Directives, Field Orders, permits, and written interpretations and clarifications in good order and annotated showing changes made during construction.

6.12.1.1. Said documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to Architect/Engineer and the Owner's Representative.

6.12.1.2. If not previously submitted, prior to Final Acceptance, said documents, Samples, and Shop Drawings will be delivered to Owner's Representative for delivery to Owner.

6.13 Safety and Protection

6.13.1. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

6.13.1.1. all persons on the Site or who may be affected by the Work;

6.13.1.2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

6.13.1.3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

6.13.2. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection.

6.13.2.1. Contractor shall notify owners of adjacent property and of Underground Facilities and utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.

6.13.2.2. All damage, injury, or loss to any property referred to in Articles 6.13.1.2 or 6.13.1.3 caused, directly or indirectly, in whole or in part, by Contractor any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Architect/Engineer or Architect/Engineer's Consultant, or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or

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indirectly employed by any of them).

6.13.2.3. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Owner's Representative has issued a notice to Owner and Contractor of Final Acceptance of the Work (except as otherwise expressly provided in connection with Substantial Completion).

6.13.3. If so provided in the bid documents, the Owner has the right to establish any reasonable monetary penalties for violations of this Section 6.13.

6.14 Safety Representative

6.14.1. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs. The safety representative at the Site may have other duties assigned to him.

6.15 Hazard Communication Programs

6.15.1. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available at the Site in accordance with Laws or Regulations.

6.16 Plans and Working Drawings; As-Built Plans.

6.16.1. Plans and Working Drawings.

6.16.1.1. The detail Plans and Specifications for the Project have been prepared by licensed and collegiate competent Architect/Engineer exercising reasonable care and are intended to show as clearly as is practicable the Work required to be performed. Contractor will rely on the accuracy of said drawings, specifically in their compliance with all applicable codes and regulations in effect on the bid opening date.

6.16.1.1.1. The Contractor realizes, however, that construction details cannot always be accurately anticipated and that in executing the Work, field conditions may require reasonable minor modifications in the details of plans and quantities of Work.

6.16.1.1.1.1. Therefore, all Work must be carried out taking into account the mentioned considerations as well as field conditions, to the satisfaction of the Owner's Representative, and in accordance with his instructions and with the Contract Documents.

6.16.2 Working Drawings

6.16.2.1. The Plans will be supplemented by such Working Drawings as are necessary to adequately control the Work.

6.16.2.2. Working Drawings for structures shall be furnished by the Contractor and shall consist of such detailed Plans as may be required to adequately control the Work and to complement the Plans furnished by the Owner.

6.16.2.3. They shall include, among others, stress sheets, shop drawings, erection plans, false work plans,

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cofferdam plans, bending diagrams for reinforcing steel or any other supplementary plans or similar data required of the Contractor.

6.16.3. Working Drawings and related documents submitted for manufactured and shop-fabricated products shall be accompanied by a certification from the manufacturer that the materials and/or equipment meet all the requirements of the Specifications.

6.16.3.1. In the event that any item is not exactly in accordance with the requirements of the Plans and Specifications, the certificate shall identify and explain each such difference.

6.16.4. Unless otherwise indicated, all Working Drawings are subject to review and acceptance by the Owner's Representative.

6.16.4.1. Such review and acceptance shall not release the Contractor from any of his responsibilities for the safe and successful completion of the Work.

6.16.4.2. The cost of preparing and furnishing all required Working Drawings is included in the Contract Price and no separate payment will be made for such Drawings.

6.17 As Built Record Drawings

6.17.1. The Contractor shall keep at the Site a copy of the Drawings marked in a neat manner that record all changes made during construction.

6.17.1.1. The set of provisional record Drawings shall be kept up to date and submitted for the inspection and approval of the Owner's Representative, at least five (5) days prior to any partial monthly payment, unless otherwise required in the Contract Documents.

6.17.2. Prior to Final Acceptance, the Contractor shall deliver the as built Drawings to the Owner's Representative.

6.17.2.1. These Drawings will be used as the draft for the preparation of the final As Built Drawings for the Project by Architect/Engineer.

6.17.3. The Architect/Engineer will, with the full cooperation of Contractor and of the Owner's representative prepare final as-built record drawings in reproducible form as reasonably required by Owner, to be delivered to the Owner.

6.17.3.1. The Owner will cause the Architect/Engineer to submit, with enough time so as not to adversely alter the critical path of the Work, the revised as-built drawings to the required governmental entities and obtain the approval of an amended Construction Permit, if same is required, and deliver the same to Owner and Contractor. This amended Construction Permit will be used to obtain the Use Permit for the project.

6.18 Notice to Proceed.

6.18.1. After the Agreement has been executed, the Contractor will be formally notified to proceed with the Work or service provided in the Contract Documents.

6.18.1.1. The Notice to Proceed will stipulate the date on which Owner expects the Contractor will begin construction and the date on which Contract Time will commence to run.

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6.18.1.2. Pre-Construction Conference.

6.18.1.2.1. Prior to the start of the Project the Owner will summon all interested parties to a Pre-construction Conference in order to organize the start of the work and other matters. If no such conference is summoned by the Owner, and in any event, the Contractor may start the Work on the date stated in the Notice to Proceed.

6.18.2. Prosecution and Progress.

6.18.2.1. After obtaining written permission issued by the Owner, the Contractor may assemble materials and equipment and start preliminary Work as soon as he is notified of the award, but no responsibility for acceptance and payment of the Work so performed shall be assumed by the Owner until and unless the Contract has been executed and the order to proceed issued.

6.18.2.2. The rate of progress in the prosecution of the Work shall be compared in accordance with Articles 4.2 and 4.3 with approved Progress Schedule as the Work progresses.

6.18.2.2.1. If the Contractor is at fault for falling thirty (30) working days or more behind the approved schedule or ten percent (10%) of Contract Time, whichever is less, Contractor shall submit a revised schedule for completion of the Work within the Contract Time and modify his operations, including, but not limited to, working overtime and on Saturdays, Sundays and legal holidays, to providing such additional materials, equipment and labor as necessary to comply with the revised schedule. Any additional cost caused by the modified schedule will be at Contractor's expense.

6.18.2.3. Should the prosecution of the Work be discontinued for any reason, the Contractor shall notify the Owner's Representative at least twenty-four (24) hours in advance of resuming operations.

6.18.3. Conformity with Plans and Specifications.

6.18.3.1. All work performed and materials furnished shall be in reasonably close conformity with the Plans and other Contract Documents requirements.

6.18.3.2. Plan dimensions and Contract Specification values are to be considered the target values to be strived for and complied with as the design values to which any allowed tolerances are applied.

6.18.3.2.1. Materials and workmanship shall be uniform in character and shall be reasonably close to the prescribed target value or to the middle portion of the tolerance range.

6.18.3.3. When the Specifications include an acceptance plan for any construction or characteristic of materials, the acceptance plan will be used by the parties to determine the attainment of Reasonably Close Conformity with plans and specifications and to assign a value to the non-conforming work which does not meet that standard.

6.18.4 Cooperation with Utilities.

6.18.4.1. The Owner will notify all utility companies, all pipe line owners, or other parties affected, and endeavor to have all necessary adjustments of the public or private utility fixtures, pipe lines, and other

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appurtenances within or adjacent to the limits of construction, which are not to be performed by the Contractor, made in accordance with the Project construction schedule.

6.18.4.2. Water lines, gas lines, wire lines, service connections, water and gas meter boxes, water and gas valve boxes, light standards, cableways, signals, and all other utility appurtenances within the limits of the proposed construction which are to be relocated or adjusted, are to be moved by their respective owners except for those to be moved by the Contractor as specifically provided in the Contract Documents.

6.18.4.3. It is understood and agreed that the Contractor has considered in his proposal all of the permanent and temporary utility appurtenances in their present or relocated positions as if same are shown on the plans and that no additional compensation will be considered for any delays, inconvenience, or damages sustained by Contractor due to any interference from the said known utility appurtenances or the operations of moving them, except in the case of failure by a utility to reasonably comply with its responsibility in relocating or adjusting its facility as required.

6.18.4.4. Prior to commencing Work, the Contractor shall make arrangements to protect the properties of all public and private utilities and other property within and adjacent to the Work area, if indicated in the Contract Documents, from damage by his construction operations.

6.18.4.5. Contractor shall cooperate with the utility owners in the removal and rearrangement of any underground or overhead utility lines or facilities to minimize interruption to service and duplication of work by the utility owners.

6.18.4.6. In the event of interruption to water or other utility services as a result of accidental breakage, or as a result of being exposed or unsupported, the Contractor shall promptly notify the proper authorities and shall cooperate with them in the restoration of service as promptly as possible.

6.18.4.7. Fire hydrants shall be kept accessible to the Fire Department at all times and no Work shall be undertaken near fire hydrants until provisions for continued service have been made.

6.18.4.8. Contractor shall be responsible for the repair costs of any damage to utility facilities caused by his equipment or operations, except for underground facilities whose existence or approximate location was previously unknown.

6.18.5. Materials.

6.18.5.1. Source of Supply and Quality Requirements.

6.18.5.1.1. The materials used in the Work shall meet all quality requirements of the Contract Documents.

6.18.5.1.2. Unless otherwise provided in the Contract Documents, all materials used in the Work shall be furnished by the Contractor from sources selected by the Contractor.

6.18.5.1.3. Materials will be tested and approved when delivered to the Project or in their final position after incorporation to the Work as provided by the individual specifications.

6.18.5.1.4. At the option of the Owner's Representative, sources of materials may be given preliminary approval before delivery is started.

6.18.5.2. Procurement and Delivery of Materials.

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6.18.5.2.1. The Contractor shall schedule the delivery at the Site of all materials and equipment required for the execution and completion of the Work at a time convenient to him so as to avoid delays in the prosecution of the Work and to allow completion of the Work within the Contract Time specified in the Contract Documents.

6.18.5.3. Earthwork Material Sources.

6.18.5.3.1. Designated Sources.

6.18.5.3.1.1. Specific sources of materials from offsite or onsite locations may be designated on the Plans and described in the Contract Documents.

6.18.5.3.1.2. Unless otherwise provided in the Contract Documents, direct payment will be made for development, preparation, erosion control, hauling and restoration of material sources or related work areas and sites.

6.18.5.3.2. Contractor Sources.

6.18.5.3.2.1. When no materials sources are designated in the Contract Documents, or if the Contractor desires to use materials from sources other than those designated, the Contractor shall be responsible for acquiring the necessary rights to take materials from the sources selected, for determining that the materials meet the specified requirements, and he shall bear all expenses for the exploration, development, erosion control and restoration of such sources, and for all costs of hauling the materials. Contractor will make sure that his sources of materials have the required permits.

6.18.5.4. Contractor's Quality Control.

6.18.5.4.1. The Contractor is responsible for the quality of all materials and workmanship furnished in the construction of the Project.

6.18.5.4.1.1. If specifically required in the Supplementary General Conditions, the Contractor shall provide his own quality control system and procedures including all personnel, equipment, supplies and facilities necessary to obtain samples, perform tests, evaluate test results and adequately control his work in order to insure that all such materials and workmanship meet the Contract requirements.

6.18.5.4.2. The Contractor shall, in all instances, perform his own process control sampling, testing and inspection during all phases of the Work as often and at a rate sufficient to assure that the Work conforms to the Contract requirements.

6.18.5.4.2.1. The Contractor shall insure that all of the testing equipment to be used is properly calibrated and meets the specifications applicable to each specified test procedure.

6.18.5.4.3. The cost of complying with Contractor's quality control obligations referred to in Article 6.18.5.4 is included in the Contract Price and no additional payment will be made therefore.

6.18.5.5. Storage of Materials.

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6.18.5.5.1. Materials shall be so stored as to assure the preservation of their quality and fitness for incorporation to the Work.

6.18.5.5.1.1. Stored materials, even though approved before storage, may again be inspected at any time prior to or during their incorporation to the Work.

6.18.5.5.1.2. Stored materials shall be located so as to facilitate their prompt inspection.

6.18.5.5.2. When authorized by the Owner's Representative, portions of the Project Site may be used for storage purposes and for the placing of the Contractor's plant/facilities and equipment provided that they are located so as not to constitute a hazard to the construction of the Project or otherwise.

6.18.5.5.2.1. Any additional space required therefore must be provided by the Contractor at his expense.

6.18.5.5.3. Private property may be used for storage purpose with written permission of the Owner or lessee, and, if requested by the Owner's Representative, copies of such written permission shall be furnished to him.

6.18.5.5.4. All temporary storage areas and plant sites shall be restored to their original condition by the Contractor, at his expense, in a manner acceptable to the Owner's Representative.

6.18.5.6. Handling of Materials.

6.18.5.6.1. All materials shall be handled in such manner as to preserve their quality and fitness for incorporation to the Work.

6.18.5.7. Materials Furnished by the Owner.

6.18.5.7.1. The Contractor shall furnish all materials required to complete the Work, except those indicated in the Contract Documents to be furnished by the Owner.

6.18.5.7.2. Except as provided in Article 6.18.5.7.4, if the material to be furnished by the Owner is to be delivered to the jobsite, the Owner, unless specified otherwise in the Contract Documents, will furnish the material to the Contractor at no cost to the Contractor and the Owner will pay for all transportation, insurance, taxes and other cost related to the furnishing of the material to the jobsite. Cost of unloading is included in the Contract Price and Contractor shall receive no additional compensation for unloading.

6.18.5.7.3. If the material to be furnished by the Owner is to be delivered to the jobsite, the Contract Documents will indicate the delivery schedule. If no such schedule is indicated, the delivery will be made as agreed by the parties. Owner shall program the delivery schedule as not to adversely affect the critical path.

6.18.5.7.4. If the material to be furnished by the Owner is not to be delivered to the jobsite the Contract Documents will indicate the terms and conditions of said delivery. If no terms and conditions are included in the Contract Documents then the cost of delivery to the jobsite is not included in the Contract Price.

6.18.5.7.5. If the material to be furnished by the Owner is not to be delivered to the jobsite the Contract Documents will indicate the date and time of availability of the material. If no such date and time is indicated, the material will be available by agreement as not to impact the critical path.

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6.18.5.7.6. The material to be furnished by the Owner will include all ancillary items included in the Technical Specification that describes the material to be furnished by the Owner, unless indicated otherwise in the Contract Documents.

6.18.5.7.7. The Owner warrants that the materials furnished by the Owner to the Contractor are of a quality sufficient for the purpose of their use. The Owner further warrants that the material to be furnished is Equal or Similar to that specified in the Technical Specification that describes the material to be furnished by the Owner.

6.18.5.7.8. The material furnished by the Owner will be of sufficient quantity including normal construction breakage, waste and shrinkage to complete the Work, unless the Contract Documents indicate otherwise.

6.18.5.7.9. The Contractor will be responsible for all Owner furnished materials delivered or made available to him in accordance with the terms and conditions of this section. If due to the fault of the Contractor, the Owner has to supply more material to the Contractor than indicated in the Contract Documents, the Owner may deduct this cost from any Partial Payment or Retainage due to the Contractor.

6.18.5.7.10. If the Owner's Representative has informed in a timely manner, the date or schedule of delivery of the material, the Contractor will be liable for all demurrage charges if he fails to receive the Owner furnished material within the time limit or schedule specified.

+ 6.18.5.7.11. Unless otherwise indicated in the Contract Documents, all costs at jobsite including unloading, handling, warehousing and Installation of the Owner furnished material are included in the Contract Price and Contractor shall not receive additional compensation therefore.

6.18.5.8. Certification of Compliance.

6.18.5.8.1. When a certification of a material or assembly is required by the Contract, each lot of such materials or assemblies delivered to the Site shall be accompanied by certificate of compliance in which the delivered material or assembly is clearly identified.

6.18.5.8.2. Commercially manufactured products shall be accompanied by certificates signed by the manufacturer and, when required, supported by tests performed by the manufacturer. Certified copies of such test results shall be furnished to the Owner's Representative.

6.18.5.8.3. Materials or assemblies accompanied by certificates of compliance may be sampled and tested at any time and if found not to be in conformity with Contract Documents will be subject to rejection at any time whether incorporated to the Work or not.

6.18.5.8.3.1. Removal of such rejected materials will be at the Contractor's expense, unless such materials have been supplied by the Owner and it was Owner's duty to test for conformity with the Contract Documents.

6.18.6 Contractor shall carry on the Work and adhere as reasonably as possible to the Progress Schedule during all Disputes or disagreements with Owner.

6.18.6.1. If the Dispute or disagreement hinders the ability of the Contractor to carry on the Work, the Contractor shall so inform the Owner.

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6.18.6.2. If the Dispute allows more than one course of action to be followed in the prosecution of the Work, the Owner's Representative may instruct the Contractor on the course of action to be followed.

6.18.6.3. No Work shall be delayed or postponed pending resolution of any Disputes or disagreements, except as permitted in section 15.4 or as Owner's Representative and Contractor may otherwise agree in writing.

6.18.7. Limitations on Operations.

6.18.7.1. Unless otherwise specified in the Contract Documents, the Contractor shall not open up new Work to the prejudice or detriment of Work already started.

6.18.7.1.1. In lineal projects, the Owner's Representative may require the Contractor to finish a section on which Work is in progress before Work is started on any additional section, if the opening of such section is essential to public safety or convenience.

6.18.7.1.2. If said order causes the Project to be delayed, the Contract Price and/or Contract Time shall be equitable adjusted.

6.19 Contractor's General Warranty and Guarantee

6.19.1. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be deficient. Contractor's warranty and guarantee hereunder excludes defects or damage after substantial, or partial completion and occupancy caused by:

6.19.1.1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or

6.19.1.2. normal wear and tear under normal usage by Owner or individuals or entities for whom Owner is responsible.

6.19.2. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:

6.19.2.1. observations by Architect/Engineer and/or Owner's Representative;

6.19.2.2. recommendation by Owner's Representative or payment by Owner of any progress or final payment;

6.19.3. the issuance of a certificate of Substantial Completion by Owner's Representative or any payment related thereto by Owner;

6.19.4. use or occupancy of the Work or any part thereof by Owner;

6.19.3. The Contractor warrants to the Owner that all materials and equipment furnished under this Contract will be new unless otherwise specified, and that all Work will be free from faults and defects and in conformance with the Contract Documents for the time periods specified in the Contract Documents or for one (1) year, whichever is

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longer, unless otherwise specified in the Contract Documents.

6.19.3.1. If required by the Owner's Representative, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

6.20 Indemnification

6.20.1. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner, Architect/Engineer, Architect/Engineer's Consultants, and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out or relating to the performance of the Work, provided that any such claim, cost, loss, or damage:

6.20.1.1. is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting there from; and

6.20.1.2. only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.

6.20.2. The indemnification obligations of Contractor under section 6.20.1 shall not extend to the Architect/Engineer and Architect/Engineer's Consultants or to their officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them arising out of:

6.20.2.1. errors and/or omissions in the preparation or approval of, or the failure to prepare or approve, maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or

6.20.2.2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

6.21 Subcontractors, Suppliers and Others

6.21.1. Award of Subcontracts for Portions of The Work.

6.21.1.1. Unless otherwise specified in the Contract Documents the Contractor, as soon as practicable after the signing of the Contract, shall furnish to the Owner's Representative in writing for his acceptance a list of the names of the main Suppliers and Subcontractors proposed for the principal portions of the Work.

6.21.1.1.1. The Owner's Representative shall promptly notify the Contractor in writing if he, after due investigation, has reasonable objection to any Supplier or Subcontractor on such list and does not accept him. Said reasonable objection may include, but are not limited to, previous default by said Subcontractor or Supplier with Owner, a record of flagrant safety violations or an unsatisfactory past performance with Owner.

6.21.1.1.1.1. The Owner's Representative shall specify in writing the reasons for such objection

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6.21.1.1.1.2. If within fifteen (15) calendar days from submittal by the Contractor, the Owner's Representative fails to make objections to any Supplier or Subcontractor on the list, the Contractor shall request the approval of the list by the Owner's Representative who shall have ten (10) days to issue his decision. If no reply is forthcoming from the Owner's Representative within the stated time, the list of Suppliers or Subcontractors shall be deemed approved.

6.21.1.1.2. The Contractor shall not contract with any Supplier or Subcontractor or any person or organization (including those who are to furnish materials or equipment fabricated to a special design) that has been rejected by the Owner's Representative in the manner indicated in Article 6.21.1.1.1, above.

6.21.1.1.3. If the Owner's Representative refuses to accept any Supplier, Subcontractor, person, or organization on a list submitted by the Contractor in response to the requirements of the Contract Documents, the Contractor shall submit an acceptable substitute.

6.21.1.1.3.1. No increase in the Contract Sum shall be allowed for any such substitution of a rejected Subcontractor and/or Supplier or other in accordance with Article 6.21.

6.21.1.1.3.2. No acceptance by Owner's Representative of any such Subcontractor, Supplier, or other individual or entity, whether initially, or as a replacement, shall constitute a waiver of any right of Owner's Representative or Engineer to reject defective Work.

6.21.1.1.4. Unless otherwise specified in the Contract Documents, the Contractor shall execute, with his own forces and organization, Work amounting to not less than twenty-five percent (25%) of the original total Contract Price.

6.21.1.1.4.1. Any items designated in the Contract Documents as "Specialty Trades or Items" shall be deducted from original total cost before computing the amount of the work required to be performed by the Contractor with his own forces and organization

6.21.2. Payments to Subcontractors.

6.21.2.1. The Contractor shall pay each Subcontractor for work performed in the Project in accordance with the terms and conditions stipulated in the contract executed by and between the Contractor and the Subcontractor.

6.21.2.1.1. The Contractor shall also require the Subcontractor to make similar payments to his Sub-Subcontractors.

6.21.3. Flow Down of Applicable Agreement Provisions.

6.21.3.1. The Contractor shall cause the inclusion, in all agreements executed by contractor with Subcontractors and Suppliers, of all applicable provisions of the Agreement with which Subcontractors and Suppliers need to comply for their proper performance on behalf of Contractor, of the duties and obligations imposed by the Contract Documents. Contractor shall also cause Subcontractor and Suppliers to include in their respective agreements with Sub-Subcontractors, and Sub-Suppliers the same duties to flow down to all lower tier agreements such applicable Agreement provisions.

6.21.4. The Contractor shall be considered as an independent contractor for all purposes under the Contract, and no persons engaged or contracted by the Contractor for the performance of Contractor's obligations shall be considered an employees or agents of the Owner.

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6.21.5. Contractor shall be fully responsible to Owner's Representative, Owner and Architect/Engineer for all acts and omissions of the Subcontractors, Suppliers, and other such individuals or entities performing or furnishing any of the Work.

6.21.5.1. Nothing in the Contract Documents shall create for the benefit of any Subcontractor or Supplier a contractual relationship between Owner's Representative, Owner or Architect/Engineer, nor shall it create any obligation on the part of Owner's Representative, Owner or Architect/Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws or Regulations.

6.21.6. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other such individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.

6.21.7. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Owner's Representative only through Contractor.

6.21.8. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner's Representative, Owner and Architect/Engineer, including required contract provisions applicable to Federal Agency funded projects.

6.21.8.1. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured on the property insurance provided in section 3.6, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights (including subrogation) against Owner, Contractor, Architect/Engineer, Architect/Engineer's Consultants, and all other individuals or entities identified in the Contract Documents to be listed as insured or additional insured (and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to Work.

6.21.8.1.1. If the insurers underwriting any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

ARTICLE 7 - ARCHITECT/ENGINEER AND DESIGNATED INSPECTOR

7.1 Administration of the Contract

7.1.1. The Owner will provide general Administration of the Construction Contract, including performance of the functions hereinafter described, through the Owner's Representative.

7.1.2. The Owner, prior to the start of the Project, will inform the Contractor in writing the name of the Owner's Representative. If the Owner's Representative is changed during the course of the project the Owner will inform the Contractor in writing the name of the new Owner's Representative. If the Contractor has valid reasons for objecting said designation, Contractor shall so inform the Owner in writing and, if Owner deems Contractor's reasons valid, a different Owner's representative shall be chosen by the Owner.

7.1.3. The Owner may from time to time change the person or entity designated as Owner's Representative, or may

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assume and/or change the functions of the Owner's Representative, and the Architect/Engineer by notifying the Contractor in writing.

7.2 Duties of Architect/Engineer and the Owner's Representative

7.2.1. The Architect/Engineer is the person or entity who prepares the Drawings and Specifications for the Owner and is responsible for the analysis, design, and code compliance of the Project.

7.2.1.1. The Architect/Engineer will make periodic visits to the site to familiarize himself generally with the progress and quality of the Work and to determine in general if the Work is proceeding in accordance with the Contract Documents.

7.2.1.1.1. Based on on-Site observations, the Architect/Engineer will keep the Owner informed of the progress of the Work, and will endeavor to safeguard the Owner against defects and deficiencies in the Work.

7.2.1.1.2. The Architect/Engineer will be the Owner's representative for technical matters related to the Contract.

7.2.1.1.3. The Architect/Engineer will be the primary interpreter of the plans and specifications.

7.2.1.1.4. The Architect/Engineer and Owner's Representative will not be responsible for the acts or omissions of the Contractor, or any Subcontractor and vice-versa, or any of their agents or employees, or any other persons performing any of the Work.

7.2.2. The Owner's Representative will represent the Owner in the interpretation of all contractual and non-technical matters. The Owner's Representative will have authority to act on behalf of the Owner to the extent provided in the Contract Documents.

7.2.2.1. All communications related to this Contract between the Contractor and Architect/Engineer shall be made thru the Owner's Representative, except that any party may directly communicate orally or by written communication with the others if authorized by the Owner's Representative, or in case of an Emergency.

7.2.2.2. The Owner's Representative may delegate some or all of his functions to Project Inspectors and/or Inspectors.

7.2.2.2.1. The Owner's Representative will inform the Contractor the name of the Project Inspectors and/or Inspectors. If the Contractor has a valid reason for not accepting the designated Project Inspector, he shall so inform the Owner in writing and if Owner deems the reason valid a different Owner's representative shall be chosen by the Owner.

7.2.2.2.2. Inspectors employed by the Owner, the Architect/Engineer and/or the Owner's Representative are authorized to inspect all work done and materials furnished, including the preparation, fabrication or manufacture of the materials to be used.

7.2.2.2.3. Inspectors also have the authority to reject any materials and work until any questions at issue can be resolved.

7.2.2.3. Owner's Representative and/or inspectors are not authorized to alter or waive the provisions of the

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Contract, to issue instructions contrary to the plans and specifications, or to act as foremen for the Contractor.

7.2.2.4. Based on his observations and the Contractor's Application for Payment, the Owner's Representative will determine the amount owed to the Contractor and will recommend approval of Payment in such amount.

7.2.2.4.1. If the Owner so requires, Architect/Engineer will also review, and approve, the Contractor's Application for Payment.

7.2.2.5. The Owner's Representative will prepare Change Orders, and Extra Work Orders, in accordance with these General Conditions.

7.2.3. The Owner's Representative, the Architect/Engineer and/or the Owner shall at all times have access to the Work either in preparation or in progress. The Contractor shall provide access to the Work so that at all times Owner's Representative may perform his duties under the Contract Documents, and Contractor shall provide such information and assistance, as is required, to make a complete and detailed inspections.

7.2.3.1. If the Owner's Representative, and/or the Owner, request it, the Contractor, at any time before Final Acceptance of the Work, shall remove or uncover such portions of the finished Work as instructed. After examination, the Contractor shall restore said portions of the Work to the standard required by the specifications.

7.2.3.1.1. Should the Work so exposed and examined prove acceptable, the uncovering, or removing, and the replacing of the covering will be paid by the Owner as extra work; but should the Work so exposed or examined prove unacceptable, the uncovering, removing, remediation and the replacing of the covering will be at the Contractor's expense.

7.2.3.1.2. Any Work done or materials used without supervision or inspection by an authorized Owner's representative may be ordered removed and replaced at the Contractor's expense unless the Owner representative failed to inspect after having been given a written notice of at least two (2) Working Days prior to the date in which Work was performed.

7.2.3.1.3. When any government agency or any utility is to accept or pay for any portion of the Work, its respective representatives shall have the right to inspect the Work. Such inspection shall not make the government agency or utility a party to the Contract. Contractor and Owner shall diligently perform all necessary actions to promote the timely inspection of the Work in a manner that does not affect the critical path.

7.2.3.1.4. The inspection of the Work and materials by the Owner shall not release the Contractor of any of his obligations under the Contract as prescribed in the plans, specifications and other Contract Documents.

7.2.3.1.5. The Owner's Representative will conduct inspections to determine the dates of Substantial Completion and final completion and will receive and review written guarantees and related documents submitted by the Contractor.

7.2.3.1.6. In case of any dispute between the Contractor and any one Project Inspector or Inspector as to materials furnished or the manner of performing the Work, the Project Inspector or the Inspector shall have the authority to reject materials or suspend the work until the question at issue can be referred to and decided by the Owner's Representative, within reasonable promptness, so as not to alter the critical path or modify substantially the float and the programmed progress of the job.

7.2.4. The Owner's Representative will be, in the first instance, the interpreter of the requirements of the Contract

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Documents, except as indicated in Article 7.2.1.3. The Owner's Representative will, within a reasonable time, render such interpretations that he, or the Contractor, if so requested, may deem necessary for the proper execution or progress of the Work.

7.2.4.1. All interpretations and decisions of the Owner's Representative shall be consistent with the intent of the Contract Documents. In his capacity as interpreter, he will exercise his best efforts to insure faithful performance under the Contract.

7.2.4.2. Claims, disputes and other matters in question relating to the execution or progress of the Work or the interpretations of the Contract Documents shall be submitted initially to the Owner's Representative for a decision in accordance with Article 11.

7.2.5. The Owner's Representative will have authority to reject work only when such work does not conform to the Contract Documents. Whenever, in his reasonable opinion, he considers it necessary or advisable, to insure the proper implementation of the intent of the Contract Documents, he will have authority to require special inspection or testing of the Work in accordance with Article 12.3 whether or not such Work is then fabricated, installed or completed.

7.2.5.1. However, neither the Owner's Representative's authority to act under this Article, nor any decision made by him in good faith either to exercise or not to exercise such authority, shall give rise to any duty or responsibility of the Owner, Owner's Representative or Architect/Engineer to the Contractor, any Subcontractor, any of their agents or employees, or any other person performing any of the Work, nor will the Contractor be released from any of his obligations under the Contract.

7.2.5.1.1. The Owner's Representative shall have the authority to stop the Work in whole or in part when such stoppage is necessary to insure the proper execution of the Work and compliance by contractor with the Contract.

ARTICLE 8 - OTHER WORK AND SEPARATE CONTRACTS

8.1 Owner's Right to Award Separate Contract, Perform Work with Owner's Employees and Utility Workers. Related Work at Site

8.1.1. Owner's Right to Award Separate Contract, Perform Work with Owner's Employees and Utility Workers.- Owner may perform other work related to the Project at the Site with Owner's employees, or by awarding separate contracts, or by having the work performed by utility workers. Written notice thereof will be given to Contractor prior to starting any such other work.

8.1.1.1. If the terms and conditions of the work to be performed by Owner's employees, separate contractors or by others, are not described in the Contract Documents prior to the bid, the Contract Time and Sum will be equitably adjusted as a result of said work and any other work to the extent that such work performed by Owner's employees, separate contractors or by others affects the Contractor's Work.

8.1.1.2. If the terms and conditions of the work to be performed by Owner's employees, separate contractors or by others are described in the Contract Documents prior to the bid, then the Contract Time and Sum will be equitably adjusted but only to the extent that said work differs from the work indicated in the Contract Documents that is to be performed by Owner's employees, separate contractors or by others.

8.1.1.3. Should the performance of other work related to the Project at the Site by Owner's employees,

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separate contractors, utility workers, that was not indicated in the Contract Documents, cause damages, delays or interferes with the Work being performed by the Contractor, the Owner will assume full responsibility and pay for all costs, expenses, and delays to which the Contractor is subjected caused by the execution and/or performance of said other work described herein if the critical path is adversely affected.

8.1.1.4. In the event one or more contracts are awarded related to the Project, the "contractor" in the contract document in each case, will be the contractor who signs each separate contract.

8.1.1.5. If there is under construction other work for Owner, by written contract or otherwise, adjacent to the limits of the site, the Contractor, if so ordered by the Owner, shall permit access to others performing such work through the Site.

8.1.1.5.1. If Owner authorizes the other contractors performing work adjacent to the Site to use said access Owner shall prescribe limitations and conditions for such use as required to protect Contractor's operations and the Work.

8.1.1.5.1.1. In accordance with this Article 8.1, the Owner will be responsible for any damages, costs, or delays caused to the Contractor by such order.

8.1.1.6. If Owner and Contractor are unable to agree on entitlement to or on the amount or time, if any, of any adjustment in the Contract Price or Contract Time necessary as a result of such other work, a Claim may be made therefore as provided in Article 11.5.

8.1.2. Coordination of the Separate Contracts and Work by Others.

8.1.2.1. Unless otherwise specified in accordance with Article 8.1.2.4, Owner shall be responsible for the coordination of the Work between the Contractor, Owner's employees, the separate contractors and any others, as to the interaction and scheduling of the various work and the proper and safe access to the Site and storage of the equipment and materials of the Contractor, the Owner's employees, the separate contractors and others contracted by Owner.

8.1.2.2. Contractor shall fully cooperate with the Owner in the coordination of the Contractor's Work with that of the Owner's employees, the separate contractors and any work by others as to the interaction and scheduling of the various work and the proper and safe access to the Site and storage of the equipment and materials of the Contractor, the separate contractors and others.

8.1.2.3. The Owner may delegate this coordination, in whole or in part, to a Construction Manager or separate contractor and must give prior notice to Contractor in writing, containing the terms and conditions of this delegation.

8.1.2.3.1. The Construction Manager or the separate contractor will act on behalf of Owner strictly within the limits of such delegation.

8.1.2.4. The Owner may delegate this coordination responsibility in whole or in part to one of the separate contractors or to the Contractor as follows:

8.1.2.4.1. If prior to the bid opening date, the Owner requires that the Contractor be responsible for the coordination of the Owner's employees, separate contracts or any work by others, the Owner will indicate the

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terms and conditions of such obligation in the bid documents and it shall be the Contractor's responsibility to include in the Contract Price whatever costs are required for this coordination of the work.

8.1.2.4.2. If the Owner requires that Contractor be responsible for the coordination of Owner's employees, separate contracts or work by others after the bid has been awarded, the Owner will indicate the terms and conditions of such obligation as a Change Order.

8.1.2.5. Contractor Coordination Meetings:

8.1.2.5.1. If the Owner, or the party with the coordinating responsibility so requires it, the Contractor shall attend coordination meetings with the Owner's employees, separate contractors or others performing work at a site to be determined by the coordinator.

8.1.2.5.1.1. The purpose of the coordination meeting shall be for the Contractor and all separate contractors and/or others performing work to coordinate schedules and construction activities to enable the construction of the different work under the separate contracts to occur on a coordinated, efficient and expeditious manner.

8.1.2.5.1.2. The coordination meeting shall also serve as forum for the Contractor and all separate contractors and/or others performing work at the site to discuss, and try to avoid and try to resolve between and among themselves any conflicts in their respective schedules or construction activities and prevent delays in one contractor's activities caused by another.

8.1.2.5.2. If the different contractors cannot reach an agreement on the coordination of the construction activities and schedule to be followed, the Owner, or his designated coordinating representative, will decide on the course of action to be followed and shall provide the necessary instructions to the Contractor, Owner's employees, separate contractors and others performing work on how to proceed, as a Field Order or, if required, as a Change Order.

8.1.3. Contractor, and any other entity contracted by the Owner to perform direct work related to the Project, shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate such other work with the work of the Contractor or any other entity contracted by the Owner to perform related work on the Project.

8.1.3.1. Contractor, or any other entity contracted by the Owner to perform related work on the Project, shall not endanger any work of others by cutting, excavating, or otherwise altering their work and will only cut or alter their work with the written consent of Owner and the others whose work will be affected.

8.1.4. The duties and responsibilities of Contractor under this Article are for the benefit of such utility owners and separate contractors to the extent that there are comparable provisions for the benefit of Contractor, including general, supplemental and special conditions, as well as similar insurance and hold harmless clauses, in said direct contracts between Owner and such utility owners and separate contractors.

8.1.4.1. Furthermore, the Owner will verify that the schedule of others contracted to perform related work on the Project does not interfere with the Project Schedule.

8.1.4.1.1. If in order to accommodate the work performed by others contracted by the Owner to perform related work in the Project, the critical path is adversely affected and/or any damage to the Work occurs, the Owner will compensate the Contractor in time and/or adjustment to Contract Price.

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8.1.5. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article, Contractor shall promptly inspect such other work and, within ten (10) working days, report to Owner in writing any delays, defects, or deficiencies in such other work that, in his opinion, render it unavailable or unsuitable for the proper execution and results of the Work.

8.1.5.1. Contractor's failure to report will constitute acknowledgement that said work is suitable, except for hidden latent defects in such work.

8.1.5.2. The same rules stated herein will apply if other entities contracted by the Owner to perform related work in the Project depend on Work performed by the Contractor.

8.2 Owner's Right to Award Separate Contract.

8.2.1. The Owner may award separate contracts in connection with other portions of the Project or additional work to the Work covered by the Contract, and if such work affects the Work, Contractor will be notified by Owner in a timely manner of the award of such separate contract.

8.2.1.1. The Owner may assign these separate contracts, as a Change Order, to the Contractor for a fee, as indicated on Article 10.5.

8.2.2. When Separate Contracts are let within the limits of any project, the Owner shall coordinate the work of each contractor so as not to interfere with or hinder the progress or completion of the Work being performed by Separate Contractors.

8.2.2.1. Contractors working on the same Project shall fully cooperate with each other.

8.2.2.2. Furthermore, the Owner will be responsible to verify that the schedule of the Separate Contractors contracted to perform Work on the Project does not interfere with the Contractor's Project Programmed Schedule previously approved for the Project.

8.2.2.2.1. Owner will compensate the Contractor, in time and/or adjustment to Contract Price, if his schedule has to be varied, and/or any damage occurs, to accommodate the work performed by other entities contracted by the Owner to perform related work in the Site.

8.3 Mutual Responsibility of Contractors

8.3.1. Each Contractor involved shall assume all liability, financial or otherwise, in connection with his Contract and shall protect and save harmless the Owner from any and all damages or claims that may arise out of the performance of the Contractor's Work.

8.3.1.1. The Owner will require from each Separate Contractor and other entities working on the Project, Contract Documents, including General, Supplemental and Special Conditions, similar to those executed with the Contractor and to include similar insurance clauses and hold harmless clauses.

8.3.1.2. The Owner will also be responsible to verify that the schedule of the Separate Contractors) and other entities working on the project do not interfere with the Contractor's Project Programmed Schedule previously approved for the Project.

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8.3.2. Should the Contractor cause damage to the work or property of any separate contractor and/or others working on the Project, the Contractor shall, be liable for said damage.

8.3.2.1. If such other separate contractor files a claim against Owner on account of any such damage alleged to have been so sustained, Contractor shall have the right to defend Owner, either by itself or in conjunction with Owner, and Contractor shall compensate Owner for damages, costs and expenses sustained therefore by Owner which are attributable to Contractor.

8.3.2.1.1. If the Contractor is found to be responsible for the alleged defects claimed by the separate contractor and any judgment or award against the Owner arises therefrom, the Contractor shall pay or satisfy it and shall reimburse the Owner for all attorney's fees and court, arbitration costs or other costs which the Owner has therefore incurred.

8.3.2.1.2. If the Contractor is found not to be responsible for the alleged defects claimed by the separate contractor, then the Owner shall pay for any judgment or award against him as well as reimburse the Contractor for all attorney's fees and court or arbitration costs incurred in defending the Owner.

ARTICLE 9-TIME

9.1 Progress and Completion

9.1.1 All time limits stated in the Contract Documents are of the essence of the Contract.

9.1.2 The time limit for the execution of this Contract has been figured out based on the Architect/Engineer and/or Owner's estimate.

9.1.2.1. Such time limit to into consideration all Sundays, legal holidays indicated in Article 1.1.1.4,1, included within the said time limit.

9.1.2.2. The Contractor will be entitled to work premium time (overtime) as required to comply with the schedule of the Project.

9.1.2.2.1. No work shall be performed on Saturdays, Sundays or legal holidays, except in cases of emergency, or unless prior written permission has been granted by the Owner's Representative.

9.1.2.2.1.1. Except in cases of emergency, request for permission to Work on Saturdays, Sundays or legal holidays shall be filed with the Owner's Representative not less than twenty four (24) hours in advance of said date, if the activity affects the critical path and not less than forty eight (48) hours if the proposed activity does not affect the critical path.

9.1.2.2.1.2. Said permission shall not be unreasonably denied.

9.1.2.2.2. Premium time (overtime) necessary in case of emergency, or for completion of daily work, or to comply with the Project schedule, shall be notified to the Project Inspector during the course of the day that said premium time will be worked.

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9.1.3. The date of commencement of the Work shall be stated in the Notice to Proceed.

9.1.3.1. The Contractor shall begin the Work on such date of commencement fixed by the Notice to Proceed.

9.1.3.2. The Contractor shall carry out the Work expeditiously with adequate forces and shall complete it within the Contract Time

9.1.3.3. A Notice to Proceed issued without the Owner having furnished all required permits and/or endorsements necessary to commence the Work which fixes a commencement date which cannot be complied with due to the lack of such permits shall constitute a valid basis for a claim by Contractor under Article 11.5 if such act adversely affects the Project's critical path and no concurrent cause of delay by the Contractor is present.

9.1.4. The Contract Time limit to execute the Work until it is substantially complete shall be that number of calendar days resulting from the sum of the original Contract Time and the authorized extensions to the original Contract Time. Said Contract Time shall start to run on the date fixed in the Notice to Proceed (the commencement date) and shall end on the date of Substantial Completion. If the work is Substantially Completed prior to said time limit, the Contractor will have achieved early completion, if Work is not Substantially Completed within said time limit, the Contractor will not have completed the Work on time in accordance with the Contract.

9.1.4.1. Time under the Contract will, stop running on the date of Substantial Completion.

9.2 Change of Contract Time

9.2.1. The Contract Time (or Milestones) may only be changed with a Change Order, Extra Work Order or by a Written Amendment.

9.2.1.1. Any Claim for an adjustment in the Contract Time (or Milestones) shall be based on a written notice submitted by the party making the claim to the Owner in accordance with the provisions of Article 11.5.

9.2.2. Any adjustment of the Contract Time (or Milestones) due to any delay beyond the control of Contractor, will be made in an amount equal to the time lost due to such delay, including its consequences, if a Claim is made therefore as provided in Article 11.5 only if such delay affect the critical path, as reflected in the monthly Progress Schedule.

9.2.2.1. Delays beyond the control of Contractor shall include, but are not limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated on these General Conditions, lack of, or lapse, of any permit, or endorsement, issued by the governmental entities having jurisdiction in the Project which are the responsibility of Owner, fires, floods, epidemics, weather conditions, or acts of God.

9.3 Delays and Extensions of Time

9.3.1. No extension of the Contract Time will be allowed for any reason except as provided below:

9.3.1.1. If satisfactory fulfillment of the Contract with authorized extension and increases requires the performance of Work in greater quantities than those set forth in the proposal so that the total final payment is

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greater than the total original Contract Price, then the time allowance will be equitably adjusted taking into account the amount and difficulty of the additional Work and only if the scope of the Work is increased or the critical path of the Project Schedule is affected.

9.3.1.2. In case of total suspension ordered by the Owner and not due to any fault of the Contractor, the total number of calendar days during which the Work is suspended shall be added to the Contract Time. In case of suspension of part of the Work ordered by the Owner not due to any fault of the Contractor, the Contract Time shall be extended to the extent that the effect that such suspension has on the Contract Time, and only to the extent the critical path of the Project Schedule is affected.

9.3.1.2.1. After Contractor has taken all reasonable steps to minimize Project overhead during the suspension, the Project fixed overhead costs incurred during the suspension by the Contractor will be reimbursed to Contractor by the Owner.

9.3.1.3. In case of damage to the Work due to Force Majeure, the Owner shall equitably adjust Contract Time based on the time required to repair the damage, provided the critical path is affected.

9.3.1.4. In case of delays or interruptions to the Work caused by any act of the Owner, or by any separate Contractor employed by the Owner or by any other cause not attributable to the fault or negligence of the Contractor, then the Contract Time shall be equitably adjusted.

9.3.1.4.1. The Project reasonable fixed overhead costs incurred by the Contractor due to the time extension caused by the acts described in Article 9.3.1.4, will be reimbursed to the Contractor by the Owner.

9.3.1.5. Every Change Order, Extra Work Order or Supplemental Agreement, if any, shall include all adjustments to Contract Time and to Contract Price related thereto, if any.

9.3.1.6. Unless otherwise specified in the Contract Documents, additional Contract Time will be allowed due to weather conditions, and their consequences, which render the performance of Work impossible.

9.3.1.7. Except as otherwise stated in this Article 9, where Contractor is prevented from completing any part of the Work within the Contract Time (or Milestones) due to delays beyond the control of both Owner and Contractor, if the critical path of the Project Schedule is affected, an extension of the Contract Time (or Milestones) for a period of time equal to the time lost due to such delay shall be Contractor's sole and exclusive remedy for such delay.

9.3.2. Extension in Contract Time shall not be considered or allowed for the following reasons:

9.3.2.1. Suspensions of Work ordered by the Owner or Owner's Representative due to the fault of the Contractor or his Subcontractor.

9.3.2.2. Unauthorized suspensions of Work by the Contractor.

9.3.2.3. Delays within the control of Contractor.

9.3.2.3.1. Delays attributable to or within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

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9.3.3 All notifications of claims for extension of time shall be made in writing by the Contractor to the Owner's Representative not more than thirty (30) working days after acquiring knowledge of the occurrence of the delay. Once made, the Contractor must supplement such claim by notice to Owner within thirty (30) working days after the event that caused the delay has concluded. If proper notification of a claim or subsequent supplemental notice is not given to Owner, then all related claims regarding increases to Contract Time, and Contract Price will be deemed waived by Contractor.

9.3.3.1. Claims for extension of time shall include:

9.3.3.1.1. the reasons for the time extension as required by the Owner's Representative;

9.3.3.1.2. the operation(s) alleged to have been delayed;

9.3.3.1.3. the calendar dates on which the operation(s) were delayed;

9.3.3.1.4. the number of calendar days by which Contractor requests Contract Time be extended;

9.3.3.1.5. a complete and detailed statement as to how the critical path was affected; and

9.3.3.1.6. a complete and detailed breakdown of adjustment to Contract Price to be claimed due to the claimed time extension, if adjustment to Contract Price is to be claimed.

9.4 Delay Damages

9.4.1. In no event shall Owner or Architect/Engineer be liable to Contractor, any Subcontractor, any Supplier, or any other person or organization, or to any surety for or employee or agent of any of them, for damages arising out of or resulting from:

9.4.1.1. delays caused by or within the control of Contractor; or

9.4.1.2. delays caused by Force Majeure and/or beyond the control of both Owner and Contractor .

9.4.1.3. delays not notified within the time specified in Article 9.3.3 or contrary to Article 9.3.3.1.

9.4.2. Nothing in this Article 9 bars a change in Contract Price to compensate Contractor due to delay, interference, or disruption directly attributable to actions or inactions of Owner or anyone for whom Owner is responsible, provided Contractor complies with the requirements of Articles 9.3.3. and 9.3.3.1.

9.5 Liquidated Damages

9.5.1. Unless otherwise specified in the Contract Documents should the Contractor or, the Surety in case of Termination for Cause, fail to complete all the Work within the time specified in the Contract or as extended by the written authorization of the Owner, a deduction of the amount stipulated herein will be made for each and every calendar day that the Work is not completed after the expiration of the time limit to execute the Work described in Article 9.1.4:

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SCHEDULE OF LIQUIDATED DAMAGES		
Original Contract Price		
From More Than	To and Including	Daily Charge
\$ 0.00	\$ 99,999.99	\$ 300.00
\$ 100,000.00	\$ 499,999.99	\$ 400.00
\$ 500,000.00	\$ 999,999.99	\$ 800.00
\$ 1,000,000.00	\$ 1,999,999.99	\$ 1,000.00
\$ 2,000,000.00	\$ 4,999,999.99	\$ 2,000.00
\$ 5,000,000.00	\$ 9,999,999.99	\$ 3,000.00
\$ 10,000,000.00	\$19,999,999.99	\$ 4,000.00
\$ 20,000,000.00	\$29,999,999.99	\$ 5,000.00
\$ 30,000,000.00	\$39,999,999.99	\$6,000.00
\$ 40,000,000.00	\$49,999,999.99	\$7,000.00
Over \$50,000,000.00	Unlimited	\$8,000.00 or as otherwise indicated in the Special Conditions

9.5.2. This amount will be deducted from any money due or that may become due the Contractor or his Surety by Owner.

9.5.3. The Original Contract Price in the above schedule of Liquidated Damages for unit price projects refers to the total original contract amount including all the units in a multi-unit contract. Liquidated damages will be applied on multi-unit contracts based on the daily charges applicable to the total original contract amount.

9.5.4. The amount stipulated in Article 9.5.1, or otherwise if otherwise specified in the Contract Document, as the case may be, shall be considered and treated not as a penalty, but as a total, fixed, and agreed upon liquidated damages due the Owner by the Contractor or, by the Surety in case of Termination for Cause, for and including but not limited to, public inconvenience, obstruction to traffic, interference with and/or loss of business, increase of engineering, inspection and administrative cost to the Owner; and other costs and expenses which have caused an expenditure of public funds, resulting from the Contractor's, or in case of Termination for Cause of the Surety's, failure to complete the work within the time specified in the Contract.

9.5.5. Permitting the Contractor to continue and finish the Work or any part thereof after expiration of the time limit for Substantial Completion described in Article 9.1.4 shall in no way operate as a waiver of any right or remedy available to Owner under this Contract or at law.

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9.6 Early Completion Incentive

9.6.1. Unless otherwise stated in the Contract Documents, should Contractor Substantially Complete the Work before expiration of the Contract Time as extended by the Owner, the Contractor shall receive an incentive pay from the Owner equal to one half (1/2) of the stipulated liquidated damages for each calendar day the Work is Substantially Completed prior to the time limit to complete the Work described in Article 9.1.4.

ARTICLE 10 - CHANGE OF CONTRACT PRICE, COST OF THE WORK AND UNIT PRICE WORK

10.1 Change of Contract Price

10.1.1. The Contract Price may only be changed by a Change Order or by a Written Amendment. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Owner in accordance with Article 11.5.

10.1.2. The value of the Work covered by a Change Order or covered by a Claim for an adjustment in the Contract Price will be determined as follows:

10.1.2.1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of section 10.4); or

10.1.2.2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with section 10.5) or by newly agreed unit prices; or

10.1.2.3. where the Work involved is either: (a) not covered by unit prices contained in the Contract Documents, or (b) agreement as to a lump sum is not reached (under Article 10.1.2.2,) the value of the work shall be computed on the basis of the Cost of the Work (determined as provided in Article 10.2) plus a Contractor's fee for overhead and profit (as provided in Article 10.5).

10.2 Cost of the Work

10.2.1. Costs Included: The term Cost of the Work means the sum of all costs necessarily incurred and paid by Contractor in the proper performance of a change in the Work. When the value of any Work covered by a Change Order, Extra Work Order or Construction Change Directive or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work. Except as otherwise agreed in writing by Owner's Representative, such costs shall be in amounts no higher than those prevailing in the locality of the Project and shall include only the items indicated below:

10.2.1.1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classification agreed upon by Owner's Representative and Contractor.

10.2.1.1.1. Such employees shall include without limitation engineers, superintendents, foremen, and other supervisory, safety, security and clerical personnel employed full time at the Site.

10.2.1.1.2. Payroll costs for employees not working exclusively in connection with the Work shall be apportioned based on their time spent working on the Work.

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10.2.1.1.3. Payroll costs shall include, but shall not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, union, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto.

10.2.1.1.4. The expenses of performing Work outside the regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above mentioned costs, to the extent authorized by Owner's Representative.

10.2.1.2. Actual cost of all necessary materials and equipment furnished and incorporated in the Work, including costs of transportation, taxes and reasonable and necessary storage thereof, and Suppliers' field services required in connection therewith.

10.2.1.2.1. All cash discounts with regard to the purchase by Contractor of materials and equipment shall accrue for the benefit of Contractor unless Owner deposits funds with Contractor with which to purchase the materials and equipment, in which case the cash discounts shall accrue to Owner.

10.2.1.2.2. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that these discounts etc. may be obtained.

10.2.1.3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors.

10.2.1.3.1. If required by Owner's Representative, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Architect/Engineer, which bids, if any, will be acceptable.

10.2.1.3.2. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Article 10.2.

10.2.1.4. Reasonable and necessary costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services exclusively related to the Work.

10.2.1.5. Supplemental costs including the following:

10.2.1.5.1. The proportion of reasonable and necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work. Airplane travel shall be on coach class and the car transportation, hotel and subsistence shall be at moderate cost.

10.2.1.5.2. Reasonable cost, including transportation, taxes and maintenance, of all materials, supplies, equipment, machinery, appliances, computers, office, warehousing and temporary facilities exclusively related to the Contract, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

10.2.1.5.3. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner's Representative with the advice of Architect/Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and

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removal thereof.

10.2.1.5.3.1. All such costs shall be in accordance with the terms of said rental agreements.

10.2.1.5.3.2. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

10.2.1.5.4. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, imposed by Laws and Regulations.

10.2.1.5.5. In such instances (only) where Contractor is insured under OCIP, or where the Owner assumes responsibility for some part of the required projects insurances (such as Builder's Risk) losses and damages (and related expenses) caused by damage to the Work, not compensated by said insurance, sustained by Contractor in connection with the performance of the Work, provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable.

10.2.1.5.5. 1. Such losses shall include settlements made with the written consent and approval of Owner's Representative. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

10.2.1.5.6. The cost of all utilities, telephone, data, fax, internet, security services, fuel, and sanitary facilities within the Site.

10.2.1.5.7. When the Cost of the Work is used to determine the value of a Change Order, or Construction Change Directive, Extra Work Order or of a Claim, the cost of premiums for additional Bonds and insurance required because of the changes in the Work.

10.2.1.5.8. An amount of the Contractor's main office overhead costs, when applicable, reached by mutual accord between the parties. If no mutual accord can be reached, the cost for main office overhead shall be computed using the Eichleay case and subsequent case law. If the Contractor does not have financial statements prepared externally by a recognized CPA, he must prepare them in order to be able to present a claim for this purpose.

10.2.2 Costs Excluded: The term Cost of the Work shall not include any of the following items:

10.2.2.1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor who work at Contractor's principal, branch or other office, other than Contractor's office at the Site, for general administration of the Work, all of which are to be considered administrative costs covered by the Contractor's fee, and not specifically included in the agreed upon schedule of job classifications referred to in Article 10.2.1.1 or specifically covered by Article 10.2.1.4.

10.2.2.2. Expenses of Contractor's principal, branch or other offices, other than Contractor's office at the Site.

10.2.2.3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed

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for the Work and charges against Contractor for delinquent payments.

10.2.2.4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, or making good any damage to property.

10.2.2.5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Articles 10.2.1.1 and 10.2.1.2, unless proven as a valid reasonable and necessary expense directly and exclusively related to the Project.

10.2.3. Contractor's Fee. When the value of any Work covered by a Change Order/Extra Work Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Article 10.5.

10.2.4. Documentation: Whenever the Cost of the Work for any purpose is to be determined pursuant to Articles 10.2.1 and 10.2.2, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Architect/Engineer, or Owner's Representative, an itemized cost breakdown together with supporting documentation and data.

10.2.5. Time Extension: Whenever additional time is required to perform extra work, said time allotment shall be included as part of the Change Order.

10.2.6. If the requirement specified in Article 10.1.2.3, above, causes a delay in the project completion, the costs of said delays, including project and main office overhead shall be added to the cost of the Work and a reasonable time extension provided under the Contract.

10.3 Cash Allowances

10.3.1. Unless otherwise stated in the Contract Documents, it is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents.

10.3.2. Items covered by allowances shall be supplied for such amount and by such persons or entities as the Owner's Representative may direct, but the contractor shall not be required to employ persons or entities against which the Contractor makes written reasonable objections.

10.3.3. If the allowance covers the cost of only furnishing material or , the allowance should include:

10.3.3.1. The cost to Contractor (less any applicable discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

10.3.3.2. Contractor's costs for unloading and handling on the Site. Labor and installation costs, have been included in the Contract Price.

10.3.4. If the allowances include the cost of furnishing and installing material or equipment to be furnished and installed by the Contractor the allowances include the cost to Contractor (less any applicable discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes plus the total cost of installation including unloading and handling.

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10.3.5 If the allowances include the cost of furnishing and installing material or equipment to be furnished and installed by a Subcontractor the allowances include the cost to the Contractor of the subcontractor's price.

10.3.6 Unless otherwise provided in the Contract Documents, insurances and bonds do not form part of the allowance price, but are included as part of the Contract Price.

10.3.7 An appropriate Change Order/Extra Work Order will be issued to reflect any difference in the actual cost of the allowance versus the amount specified in said allowance in the Contract Documents. Said amount will be due to Contractor, or credited to Owner as the case may be, on account of Work covered by allowances, and the Contract Price, and Contract Time, if necessary, shall be correspondingly equitably adjusted. Said Change Order/Extra Work Order will include the costs of bonds, insurances and fee stated in Article 10.5. If the change order is a credit, the amount credited will be the net amount due the Owner.

10.4 Unit Price Work

10.4.1 Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include, for all Unit Price Work, an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

10.4.1.1. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of bids and determining an initial Contract Price.

10.4.1.1.1. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Owner's Representative subject to the provisions of Article 13.2.1.

10.4.2 Each unit price will be deemed to include an amount considered by Contractor in the proposal to be adequate to cover Contractor's overhead and profit for each separately identified item.

10.4.3 Owner and Contractor may make a Claim for an adjustment in the Contract Price in accordance with Article 11.5 if:

10.4.3.1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and

10.4.3.2. there is no corresponding adjustment with respect any other item of Work; and

10.4.3.3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

10.5 Contractor's Fee: The Contractor's fee for overhead and profit for Work performed under a Change Order/Extra Work Order shall be determined as follows:

10.5.1. a mutually acceptable fixed fee; or

10.5.2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

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10.5.2.1. for costs incurred under Articles 10.2.1.1 and 10.2.1.2, the Contractor's fee shall be fifteen (15) percent;

10.5.2.2. for costs incurred under Article 10.2.1.3, 10.2.1.4 and 10.2.1.5, the Contractor's fee shall be ten (10) percent;

10.5.2.3. where one (1) or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Article 10.5.2.1 is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of fifteen (15) percent of the costs incurred by such Subcontractor under Articles 10.2.1.1 and 10.2.1.2 and that any higher tier Subcontractor and Contractor will each be paid a fee often (10) percent of the amount paid to the next lower tier Subcontractor;

10.5.2.4. no fee shall be payable on the basis of costs itemized under Articles 10.1.2.1 and 10.1.2.2;

10.5.2.5. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost; and

10.5.2.6. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed based on the net change in accordance with Article 10.5.2.1 through 10.5.2.5, inclusive.

ARTICLE 11 - CHANGES IN THE WORK

11.1 Authorized Changes in the Work

11.1.1 Without invalidating the Agreement and without notice to any surety, Owner, through the Owner's Representative, may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Written Amendment, a Change Order, an Extra Work Order, Work Change Directive, or a Construction Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved, which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

11.1.2 If there is agreement that said request will include an adjustment either in the Contract Sum, the Contract Time, or both, the adjustment shall be based on one of the following methods:

11.1.2.1. Mutual acceptance of a lump sum properly itemized and supported with sufficient substantiating data and documentation to permit evaluation and mutually acceptance of adjustment to Contract Time, and Contract Price if necessary;

11.1.2.2. Contract Price and Contract Time to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage Contractor's fee; or

11.1.2.3. As provided in Articles 9.2 and 10.

11.1.3 The Owner's Representative shall have authority to order minor changes in the Work not involving any adjustment in the Contract Sum or an extension of the Contract Time and not inconsistent with the intent of the Contract Documents.

11.1.3.1. Such changes shall be made by a written Field Order, or by other written orders.

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11.1.3.2. Such changes shall be binding on the Owner and the Contractor.

11.1.3.2.1. If the Contractor is not in agreement that such order does not increase either the Contract Sum or the Contract Time, the Contractor shall promptly present his Claim in the method specified in Article 11.5, herein.

11.1.4. The Owner's Representative may issue written Field Orders covering minor changes in the Work without change in Contract Sum or Contract Time.

11.1.4.1. If the Contractor is not in agreement that such Field Order does not increase either the Contract Sum or the Contract Time, he shall promptly present his claim in the method specified in Article 11.5, herein.

11.1.5. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Time, or both, that should be allowed as a result of a Work Change Directive or a Construction Change Directive, a claim may be made therefore as provided in Article 11.5.

11.2 Unauthorized Changes in the Work

11.2.1. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Time with respect to any Work performed that is not required by the Contract Documents as amended, modified, or supplemented, except in the case of an emergency as provided in Article 14.13 or in the case of testing and/or uncovering Work as provided in Articles 12.3 and 12.4.

11.3 Execution of Change Orders and Extra Work Orders

11.3.1. Owner and Contractor shall execute appropriate written Change Orders and/or Extra Work Orders (or Written Amendments) recommended by Owner's Representative covering:

11.3.1.1. changes in the Work, which are:

11.3.1.1.1. ordered by Owner's Representative pursuant to Article 11.1;

11.3.1.1.2. required because of acceptance of defective Work under Article 12.7.1 or Owner's Representative's correction of defective Work under Article 12.8; or

11.3.1.1.3. agreed to by the parties;

11.3.1.2. changes in the Contract Price or Contract Time which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive or a Construction Change Directive; and

11.3.1.3. changes in the Contract Price or Contract Time which embody the substance of any written decision rendered by Owner's Representative pursuant to Article 11.5; provided that in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws or Regulations, but during any such appeal of the Dispute, Contractor shall carry on the Work and adhere to the Progress Schedule and the Owner shall pay for such work performed subject to final resolution of the Dispute.

11.3.1.4. Owner, with the approval of the Change Order/Extra Work Order, shall submit written evidence to the Contractor that the money to pay for said Change Order Work has been assigned to make payment under the Contract.

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11.4 Notification to Surety

11.4.1. If notice of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to Contract Price or Contract Time) is required by the provisions of any Bond to be given to a surety, the giving of any such notice will be Contractor's responsibility. The penal sum of each applicable Bond will be adjusted to reflect the effect of any such change.

11.4.1.1. Owner shall submit to the pertinent government agencies any documentation required by law or regulation to be submitted for the validity or enforceability of any Change Order Work, and shall provide proof of the proper submittal of said documentation if requested in writing by the Contractor.

11.5 Claims and Disputes

11.5.1. Written notice stating the general nature of each Claim, Dispute, or other matter shall be delivered by Contractor to Owner, through Owner's Representative, promptly (but in no event later than 30 days) after the start of the event giving rise thereto.

11.5.1.1. Notice of the amount or extent of the Claim, Dispute, or other matter with supporting data shall be delivered to the Owner within sixty (60) days after the end of such event (unless Owner's Representative allows additional time for claimant to submit additional or more accurate data in support of such Claim, dispute, or other matter).

11.5.1.2. A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Article 11.1.2.

11.5.1.3. A Claim for an adjustment in Contract Time shall be prepared in accordance with the provisions of Article 9.2.2.

11.5.1.4. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event.

11.5.2. If the Dispute is not decided by the Owner's Representative, or said decision notified to Contractor within thirty (30) days following the receipt of the notice of Dispute by the Owner's Representative, the Claim shall be deemed rejected.

11.5.3. Owner's Representative's Decision: Owner's Representative will render a formal decision in writing within thirty (30) days after receipt of the submittal of the Claim. Owner's Representative's written decision regarding the Dispute, or other matter, will be final and binding upon Owner and Contractor unless:

11.5.3.1. An appeal from Owner's Representative's decision is taken within the time limits and in accordance with the dispute resolution procedure set forth in Article 16.

11.5.4. No Claim for an adjustment in Contract Price or Contract Time (or Milestones) will be valid if not submitted in accordance with this section 11.5.

ARTICLE 12 - TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

12.1 Notice of Defects

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12.1.1. Prompt notice of all defective Work of which Owner, Owner's Representative and Architect/Engineer has actual knowledge will be given to Contractor. If no notice is promptly given to Contractor of previously known defective Work, it shall be deemed acceptable to Owner.

12.1.2. All defective Work may be rejected, corrected, or accepted as provided in this Article.

12.2 Access to Work

12.2.1. Owner, Owner's Representative, Architect/Engineer, Architect/Engineer's Consultant, other representatives and personnel of Owner, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspecting, and testing. Said access shall be previously coordinated with Contractor.

12.2.1.1. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's Site safety procedures and programs so that they may comply therewith as applicable.

12.3 Tests and Inspections

12.3.1. Inspection of Materials

12.3.1.1. Unless otherwise specified in the Contract Documents, all materials are subject to inspection, sampling, testing, retesting and rejection by the Owner's Representative as provided in the specifications and prior to acceptance of the Work.

12.3.1.2. Any work in which untested and unaccepted materials are used without the approval of the Owner's Representative, except if said material is the one specified in the Contract Documents, will be performed at the Contractor's risk.

12.3.1.1.2.1. Material found to be unacceptable will not be paid for and, if directed by the Owner's Representative, shall be removed at the Contractor's expense.

12.3.1.3. Unless otherwise indicated in the Contract Documents, the sampling of materials for testing will be performed by Owner's Representative personnel or by other personnel designated by the Owner, at Owner's expense.

12.3.1.1.3.1. Where sampling by the Contractor is specified, the samples shall be taken using approved Contractor furnished sampling devices, under the supervision of the Owner's Representative, and at such times or intervals as directed.

12.3.1.1.3.2. When materials are tested by the Owner, copies of the test reports will be furnished to the Contractor. Unless otherwise required in the Contract Documents, tests may or may not be performed by Owner and the Contractor shall not rely on the results of the Owner testing being available for process control.

12.3.1.4. Plant Inspection: Owner's Representative may undertake the inspection of materials at the production plant. In the event plant inspection is undertaken the following conditions shall be met:

12.3.1.1.4.1. The Owner's Representative shall have the cooperation and assistance of the Contractor and the producer with whom he has contracted for materials.

12.3.1.1.4.2. The Owner's Representative shall have full entry at all times to such parts of the plant as may

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concern the manufacture or production of the materials being furnished.

12.3.1.1.4.3. Adequate safety measures shall be provided and maintained.

12.3.2 Contractor shall give Owner's Representative timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspections and testing personnel to facilitate required inspections or tests. No delays, or hindrance in the performance of the Work, shall be caused by tardiness in Owner's Representative's inspection of the Work.

12.3.2.1. The Contractor shall submit to the Owner's Representative, within twenty (20) calendar days following the date of Notice to Proceed, the name of the local testing laboratory (ies) proposed for use with respect to the Work.

12.3.2.1.1. The Owner's Representative shall, within ten (10) calendar days after receipt of the submittal of the proposed testing laboratory(ies), approve said laboratory (ies), or submit written reasons for his disapproval.

12.3.2.1.2. If no notice of approval or disapproval is received within said period of time, Contractor shall submit the request for approval to the Chief of Construction or equivalent division head of Owner who shall have ten (10) calendar days to issue his decision. If the Chief of Construction or equivalent division head of Owner does not render his decision within said time, the testing laboratory (ies) will be deemed approved by the Owner's Representative.

12.3.3. Unless otherwise provided in the Contract Documents, Owner's Representative shall employ and pay for the services of independent testing entities to perform all inspections, tests, or approvals required by the Contract Documents except for inspections, tests, or approvals covered by Article 12.3.4. The costs incurred in connection with tests or inspections conducted pursuant to Article 12.4.2.1 shall be paid as provided in Article 12.4.

12.3.3.1 Whenever Contractor is responsible for arranging, obtaining and paying for costs in connection with any inspection, test, or approval required for Owner's Representative's or Architect/Engineer's acceptance of materials, mix designs, or equipment, the inspecting or testing entity shall be submitted for approval by Owner's Representative and the inspection or test shall be performed prior to Contractor purchasing such materials, mix designs, or equipment for incorporation to the Work.

12.3.3.1.1. Unless otherwise indicated in the Contract Documents, such inspections, tests, or approvals shall be performed by organizations acceptable to Owner, Owner's Representative and Architect/Engineer, whose acceptance shall not be unreasonably denied.

12.3.4. If Laws or Regulations of any public body having jurisdiction, at bid opening date, require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Owner's Representative the required certificates of inspection or approval. If said Laws and Regulations are enacted after bid opening date, the costs for said inspections shall be borne by the Owner.

12.4 Uncovering Work

12.4.1. If a portion of the Work, whether or not inspected, tested or approved is covered contrary to the Owner's Representative written request or to requirements specifically expressed in the Contract Documents,

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it must, if required in writing by the Owner's Representative be uncovered for the Owner's Representative observation and be replaced or reconstructed at the Contractors expense without change in the Contract Time and Amount.

12.4.2. If a portion of the Work whether or not inspected, tested or approved has been covered and the Owner's Representative had not specifically required its inspection in writing prior to being covered, the Owner's Representative may required its inspection and it shall be uncovered by the Contractor.

12.4.2.1. If it is found that such Work is defective, Contractor shall pay all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others.)

12.4.2.2. If however, such Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Time (or Milestones), or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction.

12.5 Correction or Removal of Deficient Work

12.5.1. Contractor shall correct all deficient Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Owner's Representative's, remove it from the Project and replace it with Work that is not deficient. Contractor shall bear, exclusively, the cost of correcting such deficient Work.

12.6 Correction Period

12.6.1. If within one (1) year after the date of Substantial Completion or such longer period of time as may be prescribed by Laws or Regulations or by the terms of any applicable special guarantee required by the Contract Documents or by any specific provision of the Contract Documents, any Work is found to be deficient; or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations, at the Effective Date of the Agreement, as contemplated in Article 6.11.1 is found to be deficient, in all such instances Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

12.6.1. 1. repair such deficient land or areas; or

12.6.1.2. correct such deficient Work or, if the deficient Work has been rejected by Owner, remove it from the Project and replace it with Work that is not deficient, and

12.6.1.3. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or other's land or areas resulting therefrom.

12.6.1.3.1. If Contractor does not, after a ten (10) day written notice from Owner, promptly start complying and diligently comply with the terms of such instructions, (or in an emergency where delay would cause serious risk of loss or damage), Owner may have the deficient Work corrected or repaired or may have the rejected Work removed and replaced, and all costs, arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.

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12.6.2. In special circumstances where a particular item of equipment is placed in continuous service, at the request of the Owner's Representative, before Substantial Completion of all the Work, the correction period for that item shall start to run from the date that said equipment is placed on service.

12.6.3. Where deficient Work (and damage to other Work resulting there from) has been corrected or removed and replaced under this section 12.6, the correction period hereunder with respect to such Work will be extended for an additional period of one (1) year after such correction or removal and replacement has been satisfactorily completed.

12.7 Acceptance of Non-Compliant Work

12.7.1. If both parties agree, instead of requiring correction or removal and replacement of deficient Work, and Owner (prior to Architect/Engineer's recommendation of final payment) prefers to accept it, Owner may do so.

12.7.1.1. If both parties cannot reach agreement on acceptance of deficient work, then the Contractor shall correct such deficient Work to Owner's satisfaction or either party may make a Claim as provided in Article 11.5.

12.7.2. If any such acceptance occurs prior to Owner's Representative's recommendation of final payment, a Change Order/Extra Work Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted.

12.7.2.1. If the parties are unable to agree as to the amount thereof, either party may Claim as provided in Article 11.5.

12.8 Owner's Right to Correct Deficient Work

12.8.1. If Contractor fails within a reasonable time after written notice from Owner's Representative to start correction of deficient Work or to diligently prosecute correction or to remove and replace rejected Work as required by Engineer in accordance with Article 12.6.1, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to substantially comply with any other provision of the Contract Documents, Owner may, after seven (7) days written notice to Contractor, correct and remedy any such deficiency.

12.8.2. In exercising the rights and remedies under this paragraph. Owner shall proceed expeditiously.

12.8.2.1. In connection with such corrective and remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere.

12.8.2.2. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Architect/Engineer and Architect/Engineer's Consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.

12.8.3. All costs incurred or sustained by Owner in exercising the rights and remedies under this Article 12.8 will be

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charged to Contractor.

12.8.3.1. If the parties are unable to agree as to the amount of the adjustment, a Claim therefore may be made as provided in Article 11.5.

12.8.3.1.1. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's deficient Work.

12.8.4. Contractor shall not be allowed an extension of the Contract Time (or Milestones) because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Article 12.8.

ARTICLE 13 - PAYMENTS AND COMPLETION

13.1 Proposal Schedule and Schedule of Values

13.1.1. Proposal Schedule (Unit-Price Contracts)

13.1.1.1. In Unit-Price Contracts, the quantities in the proposal schedule are approximate only and the actual quantities to be paid for cannot be determined until the work is performed and accepted. Increases or decreases in the proposal schedule quantities will be considered as normal overruns or underruns, and the Contractor shall accept as payment in full, so far as contract items are concerned, payment at the original contract unit prices for the accepted quantities of work performed.

13.1.1.2. Payments to the Contractor shall be made only for the actual quantities of each contract item, performed and accepted in accordance with the plans and specifications and, if upon completion of the construction, these actual quantities shall show either a decrease or increase from the quantities in the proposal schedule, the contract unit prices will prevail.

13.1.1.2.1. In Unit-Price Contracts, the Contractor will submit for approval to the Owner's Representative a schedule of values for those Lump-Sum bid items only.

13.1.1.2.2. This schedule, when approved by the Owner's Representative, shall be used solely as a basis for the monthly partial payments.

13.1.1.3. If the "Basis of Payment" in the specifications relating to any unit price in the bid schedule requires that said unit price cover and be considered compensation for certain work or material essential to the item, this same work or material will not also be measured or paid for under any other pay item which may appear elsewhere in the Contract Documents.

13.1.2. Schedule of Values (Lump-Sum Contracts)

13.1.2.1. In Lump-Sum Contracts, the Contractor, within fifteen (15) days after the date of the Notice to Proceed, will submit for approval, to the Owner's Representative, a schedule of values prepared in approved forms of the various portions of the Work aggregating the total Contract Sum, divided so as to facilitate monthly partial payments.

13.1.2.2. Each item in the schedule of values shall include its proper share of overhead and profit. Initial disbursements items such as mobilization, temporary facilities, premiums for insurance, and bonds and all cost of government fees and permits required for work, shall be separately itemized to facilitate first partial payment.

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13.1.2.3. This schedule, when approved by the Owner's Representative, shall be used solely as a basis for the monthly partial payments and not as unit prices for changes in the Work.

13.1.2.4. The schedule of values shall be approved, or rejected in writing for cause notified to Contractor within fifteen (15) calendar days after receipt by Owner's Representative.

13.1.2.4.1. Any individual item on the schedule of values that is rejected by the Owner's Representative must be properly identified and reason for rejection substantiated and notified to the Contractor within said time period.

13.1.2.4.2. The Owner's Representative may allow certain individual items to appear in the schedule of values as lump sum items. These items must be broken down into individual items prior to request any partial payment regarding said individual item.

13.1.2.5. If the Owner's Representative does not reject the schedule of values as specified herein, then the same shall be deemed approved.

13.2 Progress Payments

13.2.1. Applications for Payments

13.2.1.1. The Progress Payment Period shall be one (1) month long unless otherwise indicated in the Contract Documents. The end of the Progress Payment period shall be the last day of the month unless otherwise established in the Contract Documents. The Contractor does not have to submit an application for payment every month if he so chooses.

4 13.2.1.2. At least twenty (20) days before the date established for each progress payment, Contractor shall submit to Owner's Representative for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents.

13.2.1.3. The determination of quantities of acceptable completed Work under the terms of the Contract Documents will be jointly made by the Owner's Representative and Contractor. It will be based on measurements made by them, or their assistants, according to the units of measurement for each item as shown in the schedule of values and by the method indicated in the corresponding specification, if so indicated in said specification for said item.

13.2.1.4. If the requested payment is based on materials and equipment not incorporated in the Work, but delivered and suitably stored at the Site, or at another location, agreed to in writing, the Application for Payment shall also be accompanied by: (i) a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and (ii) evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein. All evidence required herein shall be in form satisfactory to Owner.

13.2.1.4.1. Such advance payment may be made to the Contractor for the cost of materials that are to be incorporated into the work, provided the materials meet the requirements of the plans and specifications and are on hand at the Site or stored in acceptable storage places.

13.2.1.4.1.1. No advance payment will be made on living or perishable plant materials.

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13.2.1.4.1.2. In the case of materials that have been purchased by the Contractor, the cost shall be determined by the vendors invoice.

13.2.1.4.1.3. In the case of materials manufactured or obtained by the Contractor through the use of his own workmen or equipment, the cost will be determined by the Owner's Representative in accordance with and based upon that particular unit of the Project in which the materials are to be utilized.

13.2.1.4.2. The Contractor shall present signed receipts or other documentary evidence to prove that the cost of the materials for which he is to receive advance payment has been paid in full or, if the materials have not been paid for, the invoice shall be accompanied by a release from the materials dealer expressing his agreement with the payment for such materials to the Contractor by the Owner.

13.2.1.4.3. If at any time after the Contractor has received advance payment for materials on hand at the Site, the Owner or Owner's Representative obtains evidence indicating that said materials, or any part or parts thereof, are defective, or that said materials, or parts thereof, do not conform to the specifications, the Owner will proceed to deduct from any of the succeeding partial payments due the Contractor for work actually performed, a sum sufficient to cover the cost of the materials, or part or parts thereof, found to be defective.

13.2.1.4.4. Materials for which the Contractor has received advance payment shall be properly housed at the Site or in acceptable storage places in the vicinity of the Project in a secure manner that will insure the preservation of their quality and fitness for the Work.

13.2.1.4.4.1. Moreover, the Contractor shall not withdraw said materials for any purpose other than incorporation into the Project, unless he has written consent from the Owner or Owner's Representative to do so.

13.2.1.4.4.2. Storage and protection costs and the cost of replacing lost or damaged materials shall be borne by the Contractor.

13.2.1.4.5. Approval of partial payments for stockpiled materials will not constitute acceptance of such materials for use in completing items of Work.

13.2.1.4.6. An amount equal to the value of materials incorporated into the Work and for which an advance payment has been made, shall be deducted from the partial estimates.

13.2.1.4.7. Unless otherwise specified in the Contract Documents, Payment shall be made to the Contractor for materials fabricated, pre-cast or otherwise produced for the Project and stored at an approved site in Puerto Rico other than in the immediate vicinity of the Project, provided the Contractor furnish and file with the Owner insurance which shall protect the Contractor and the Owner from all risk of physical loss or damage to these materials.

13.2.1.4.7.1. The amount of such insurance shall not be less than the value of such materials.

13.2.2. Retainage

13.2.2.1. The amount of retainage with respect to progress payments shall be as stipulated in the bid documents.

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13.2.2.1.1. Unless otherwise specified in the Contract Documents, such retainage shall be five percent (5%) of each partial payment made to the Contractor.

13.2.2.1.1.1. In cases in which a ten percent (10%) Retainage is required by Owner, then after fifty percent (50%) of the Work has been completed to the Owner's Representative's satisfaction and the Project is on schedule and the quality of Work is satisfactory to the Owner's Representative, all the remaining payments may be made in full.

13.2.2.1.2. Immediately after the Owner's Representative, on the basis of an inspection, has determined and certified that the Work is sufficiently complete, or the Work has been occupied for the use for which it was intended, the Owner will release to the Contractor fifty percent (50%) of the amount previously retained provided the following conditions are met.

13.2.2.1.2.1. A written consent of Surety to make such payment is submitted.

13.2.2.1.2.2. There are no claims to be settled from the Owner to the Contractor.

13.2.2.1.2.3. There are no liquidated damages due.

13.2.2.1.2.3.1. However, at Owner's discretion, the Owner may release to Contractor the difference between fifty percent (50%) of the retainage and the amount of liquidated damages.

13.2.3. Review of Applications

13.2.3.1. The Owner's Representative will review the Application for Payment as soon as it is received and will notify the Contractor within five (5) working days of any exceptions he may have. The Contractor will make the necessary corrections and resubmit the Application.

4 13.2.3.2. The Owner's Representative will, within seven (7) days of the Contractor's date of submittal or five (5) days from the date of resubmission, if the corrections are acceptable, submit the approved Application for Payment to the Owner with all required documentation and approvals from the Architect/Engineer and the Owner's Representative.

13.2.3.3. Owner's Representative's recommendation of any payment requested in an Application for Payment will constitute a representation by Owner's Representative to Owner, based on Owner's Representative's observations on the Site of the executed Work as an experienced and qualified professional and on Owner's Representative's review of the Application for Payment and the accompanying data and schedules, that to the best of Owner's Representative's knowledge, information and belief.

13.2.3.3.1. the Work has progressed to the point indicated

13.2.3.3.2. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent test called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work, and to any other qualifications stated in the recommendation); and

13.2.3.3.3. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled

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in so far as it is Owner's Representative's responsibility to observe the Work.

13.2.3.4. By recommending any such payment, Owner's Representative will not thereby be deemed to have represented that:

13.2.3.4.1. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Owner's Representative in the Contract Documents; or

13.2.3.4.2. that there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

13.2.3.5. Neither Owner's Representative's review of Contractor's Work for the purposes of recommending payments nor Owner's Representative's recommendation of any payment, including final payment, will impose responsibility on Owner's Representative to supervise, direct, or control the Work or for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work.

13.2.3.5.1. Additionally, said review or recommendation will not impose responsibility on Owner's Representative to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

13.2.3.6. Owner's Representative may refuse to recommend in whole or in part of any payment if, in Owner's Representative's reasonable opinion, it would be untruthful to make the representations to Owner referred to in Article 13.2.3.3.

13.2.3.6.1. Owner's Representative may also (i) refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, (ii) revise or (iii) revoke any such payment recommendation previously made, to such extent as may be necessary in Owner's Representative's reasonable opinion to protect Owner from loss because:

13.2.3.6.1.1. the Work is defective, or completed Work has been damaged, requiring correction or replacement;

13.2.3.6.1.2. the Contract Price has been reduced by Written Amendment, Change Orders or Extra Work Orders to the extent that justifies withholding payment;

13.2.3.6.1.3. Owner has been required to correct deficient Work or complete Work and has not yet done so; or

13.2.3.6.1.4. Owner's Representative has actual knowledge of the occurrence of any of the events enumerated in Article 15.2.1.

13.2.4. Payments Becomes Due

13.2.4.1. Unless otherwise specified in the Contract Documents, forty (40) days after Owner's approval of the Application for Payment, with Owner's Representative's recommendation, the amount recommended will become due, and when due, shall be paid by Owner to Contractor.

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13.2.5. Reduction in Payment

13.2.5.1. The Owner's Representative, without incurring in liability, may decline to approve any Application for Payment or, because of subsequently discovered evidence or subsequent inspection, he may nullify the whole or any part of any Application for Payment previously issued, to such extent as may be necessary in his opinion to protect the Owner from loss because of:

13.2.5.1.1. Deficient Work not remedied; or

13.2.5.1.2. Failure of the Contractor to comply with any requirements of the Contract Documents.

13.2.5.2. Owner may refuse to make payment of the full amount recommended by Owner's Representative because:

13.2.5.2.1. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;

13.2.5.2.2. Liens have been filed in connection with the Work, except where Contractor has delivered a specific Bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;

13.2.5.2.3. there are other items entitling Owner to a set-off against the amount recommended; or

13.2.5.2.4. Owner has actual knowledge of the occurrence of any of the events enumerated in Article 13.2.3.6 or 15.2.1.

13.2.5.3. If Owner refuses to make payment of the full amount recommended by Owner's Representative, Owner must give Contractor immediate written notice (with a copy to Owner's Representative) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld.

13.2.5.3.1. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor corrects to Owner's Representative's satisfaction the reasons for such action.

13.2.5.3.2. If it is subsequently determined that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Article 13.2.4.

13.2.5.4. Partial payments may be suspended when in the judgment of the Owner the Work has not proceeded according to the terms of the Contract Documents.

13.2.5.5. If at any time during the construction of the Project, the Owner receives proper notice from a third party stating a claim under Civil Code Article 1489, the Contractor shall settle the claim with the third party within fifteen (15) calendar days from the notice to the Owner and inform the Owner of said settlement or otherwise if Contractor disputes the validity of said claim, post a bond, acceptable to Owner, for the benefit of Owner to protect Owner against liability for payment to the third party under Civil Code Article 1489 in which case partial payment therefore will not be withheld. This will apply in any project where there is no Payment or Performance Bond, or the penal sum of such bond is an amount less than one hundred (100) percent of the Contract Sum.

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13.2.5.5.1. If no settlement is reached or a bond is not posted and accepted, the Owner, the Contractor, and the claimant third party shall meet within thirty (30) days after the expiration of the fifteen (15) calendar days to ascertain the amount of the alleged debt.

13.2.5.5.2. Contractor shall then pay within five (5) calendar days the undisputed amount. If no payment is made, the Owner shall retain said amount from the next partial payment and proceed to pay directly the undisputed amount to the third party. If the Contractor posts a bond as provided in Article 13.2.5.5 the Owner will not withhold said amount from Contractor and will not pay the amount to the third party claimant until the Contractor or the third party claimant notify Owner that the dispute among them has been resolved at which time Owner will act accordingly.

13.2.6. Scope of Payment

13.2.6.1. The payment of any partial estimate or of any retained percentage, in no way shall release the obligation of the Contractor to renew or repair any deficient materials used in the construction, or to be responsible for all damage due to such deficiencies.

13.2.6.2. No payment will be made for any unauthorized work.

13.2.6.3. No certificate for a progress payment, nor any progress payment, or any partial or entire use or occupancy of the Project by the Owner shall constitute an acceptance of any Work not in accordance with the Contract Documents.

13.3 Contractor's Warranty of Title

13.3.1. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment, and will pass free and clear of all Liens, Claims, security interests or encumbrances. Contractor also warrants and guarantees that no Work, materials, or equipment covered by an Application for Payment has been acquired by the Contractor, subject to an agreement under which an interest therein, or an encumbrance thereon, is retained by the seller or otherwise imposed by the Contractor or such other person. This will also apply to any other person performing the Work for the Project on behalf of Contractor, or furnishing materials and equipment for the Project.

13.4 Substantial Completion

13.4.1. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Owner's Representative in writing that the entire Work is Substantially Complete (except for items specifically listed by Contractor as incomplete) and request that Owner's Representative issue a Certificate of Substantial Completion. Owner may, at its sole option, request that part of the Work be declared Substantially Complete as provided in Article 13.5.1.

13.4.1.1. Within five (5) working days after such request, Owner, Contractor and Owner's Representative shall make an inspection of Work to determine the state of completion. If within this time period, the Owner's Representative fails to make objections or respond, the Contractor shall request the approval of the Chief of Construction or equivalent division head of Owner which shall have fifteen (15) working days to issue its approval or disapproval of the Certificate of Substantial Completion.

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13.4.1.1.1. If Owner's Representative does not consider the Work substantially complete, Owner's Representative will notify Contractor in writing, within five (5) working days after the inspection, giving the reasons therefore.

13.4.1.1.2. If Owner's Representative considers the Work substantially complete, Owner's Representative will prepare and deliver to Owner, within ten (10) working days after the inspection, a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion.

13.4.1.1.3. There shall be attached to the certificate a tentative list of items (punch list) to be completed or corrected before final payment.

13.4.1.2. Owner shall have ten (10) working days after receipt of the tentative certificate during which to make written objection to Owner's Representative as to any provisions of the certificate of Substantial Completion or attached list.

13.4.1.3. If, after considering such objections, indicated on Article 13.4.1.2, Owner's Representative concludes that the Work is not substantially complete, Owner's Representative will within fifteen (15) working days after submission of the tentative certificate of Substantial Completion to Owner notify Contractor in writing, stating the reasons therefore.

13.4.1.4. If, after consideration of Owner's objections, indicated on Article 13.4.1.2, Owner's Representative considers the Work Substantially Complete, Owner's Representative will, within said fifteen (15) working days, execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised final punch list of items to be completed or corrected). Such final certificate will reflect such changes from the tentative certificate as Owner's Representative believes justified, after consideration of any objections from Owner.

13.4.1.5. At the time of issuance of the certificate of Substantial Completion, Owner will assume all responsibilities with respect to security, operation, safety, and protection of the Work, maintenance, utilities, insurance, and Contractor warranties and guarantees periods will start to run.

13.4.1.6. Unless Owner and Contractor agree otherwise in writing and inform Owner's Representative also in writing prior to Owner's Representative's issuing the definitive certificate of Substantial Completion, Owner's Representative's aforesaid recommendation will be binding on Owner and Contractor until final payment is made.

13.4.2. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion, but Owner shall allow Contractor reasonable access to complete or correct items on the final punch list.

13.5 Partial Utilization

13.5.1 Use by Owner, at Owner's option, of any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Owner's Representative, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose, without significant interference with Contractor's performance of the remainder of the Work, may be effected (put to such use) prior to Substantial Completion of all the Work subject to the following:

13.5.1.1. Owner at any time may request Contractor in writing to permit Owner to use any such part of the Work which Owner believes to be ready of its intended use and substantially complete.

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13.5.1.1.1. If Contractor agrees that such part of the Work is substantially complete, Contractor will certify to Owner and Owner's Representative that such part of the Work is substantially complete and request Owner's Representative to issue a certificate of Substantial Completion for that part of the Work.

13.5.1.1.2. Contractor at any time may notify Owner and Owner's Representative in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Owner's Representative to issue a certificate of Substantial Completion for that part of the Work.

13.5.1.1.2.1. Within a reasonable time (not more than fifteen (15) days) after either party's request, Owner, Contractor, and Owner's Representative shall make an inspection of that part of the Work subject to the request to determine its state of completion.

13.5.1.1.2.2. If Owner's Representative does not consider that part of the Work to be substantially complete, Owner's Representative will notify Owner and Contractor in writing giving the reasons therefore.

13.5.1.1.2.3. If Owner's Representative issues a certificate of Substantial Completion for said part of the Work thereupon all applicable provisions of Article 13.4 shall apply.

13.5.1.1.3. No occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Article 13.4.1.5 regarding property insurance.

13.6 Final Inspection

13.6.1. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Owner's Representative will, within five (5) working days, make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars this inspection reveals with regard to incomplete or deficient Work.

13.6.1.1. Contractor shall immediately take measures to complete such Work and remedy such deficiencies.

13.7 Final Payment

13.7.1. Application for Payment

13.7.1.1. After Contractor has, in the opinion of Owner's Representative, satisfactorily remedied all incomplete and deficient Work identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, Bonds, certificates or other evidence of insurance, certificates of inspection, marked-up record documents, and other documents required by the Contract, Contractor may make application for final payment following the procedure for progress payments.

13.7.1.2. The final Application for Payment shall be accompanied, except if previously delivered to Owner's Representative, by:

13.7.1.2.1. all documentation, guarantees, Bonds and insurance called for in the Contract; and.

13.7.1.2.2. consent of the surety, if any, to final payment; and

13.7.1.2.3. complete and legally effective releases, or waivers, (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.

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13.7.1.3. In lieu of the releases or waivers of Liens specified in Article 13.7.1.2.3, if approved by Owner, Contractor may furnish payment receipts or releases in full as part of an affidavit executed by Contractor to the effect that:

13.7.1.3.1. the releases and receipts include all liabilities related to labor, services, material, and equipment for which a Lien could be filed; and

13.7.1.3.2. all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner and Owner's property might in any way be responsible, have been paid or otherwise satisfied.

13.7.1.3.3. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a Bond or other collateral satisfactory to Owner to indemnify Owner against liability related to any such Lien.

13.7.2 Review of Final Application for Payment and Acceptance of the Work.

13.7.2.1. If, on the basis of Owner's Representative's observation of the Work during construction and final inspection, and Owner's Representative's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Owner's Representative is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Owner's Representative will, within fifteen (15) days after receipt of the final Application for Payment, indicate to Owner in writing Owner's Representative's recommendation regarding payment and if payment is recommended present the Application for Payment to Owner, for payment.

13.7.2.1.1. At the same time, Owner's Representative will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Article 13.9.

13.7.2.1.2. Otherwise, within the time specified in Article 13.7.2.1, Owner's Representative will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment. If within said fifteen (15) days after submittal of the final Application for Payment by Contractor the Owner's Representative fails to make objections or respond, the Contractor shall request approval directly from the Owner who shall have fifteen (15) working days to issue approval or disapproval, provided Contractor has also given the same timely notice directly to Owner as required in Article 17.3.2. If no reply is forthcoming from the Owner within the stated time, the final Application for Payment shall be deemed approved.

13.7.3. Final Payment Becomes Due

13.7.3.1. Unless otherwise specified in the Contract Documents, forty (40) days after Owner's approval of the Application for Final Payment, with accompanying documentation, the amount recommended by Owner's Representative will become due, and when due, shall be paid by Owner to Contractor.

13.7.3.2. If payment is not made within the time stated in Article 13.7.3.1., thereafter Owner will pay Contractor interest at the legal rate on the amount due.

13.8 Final Completion Delayed

13.8.1. If, through no fault of the Contractor, final completion of the Work is significantly delayed, and if Owner's

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Representative so confirms, Owner shall, upon receipt of Contractor's final Application for Payment and recommendation of Owner's Representative, and without terminating the Agreement, make payment of the balance due for that portion of the Work fully completed and accepted.

13.8.2. If the remaining balance to be held by Owner for Work not fully completed, or corrected, is less than the retainage stipulated in the Agreement, and if Bonds have been furnished as required in Article 3, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Owner's Representative with Application for such payment.

13.8.2.1. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of any claim or of any right under the Contract.

13.9 Waiver of Claims

13.9.1. The making and acceptance of final payment will constitute:

13.9.1.1. a waiver of all Claims by Owner against Contractor, except for Claims arising from unsettled Liens, from deficient Work appearing after final inspection as the result of failure to comply with the Contract Documents, from special guarantees or from Contractor's continuing obligations under the Contract Documents; and

13.9.1.2. a waiver of all other unsettled Claims by Contractor against Owner, other than those previously made in a timely manner in writing.

13.10 Unilateral Liquidation

13.10.1. The procedures established in this section will be applicable whenever the Contractor is not available in order for the Owner to issue the final payment in accordance with Article 13.7.

13.10.1.1. For purposes of this section, the term "unavailable" shall mean that the Contractor repeatedly fails to answer Owner's requests to meet with the Owner and/or to submit the required documentation under Article 13.7 in order to proceed with the final payment and Project liquidation.

13.10.2. If Contractor is unavailable, Owner shall proceed to issue and process the final application for payment. In order to accomplish this, whenever possible, the Owner will seek to obtain the documentation required under Article 13.7.1.2 and 13.7.1.3.

13.10.2.1. When Owner can not obtain documentation required under Article 13.7.1.2 and 13.7.1.3 such documentation it may be waived by Owner in order to proceed to the issuance of final payment. However, in case of such waiver, Owner may impose those reasonable conditions Owner deems relevant in order to protect Owner's interests and safeguard against claims by third parties.

13.10.3. If after finalizing liquidation of the Contract, payment is due Contractor and Contractor remains unavailable, Owner will retain such payment until Contractor is available to collect such payment. If the Final Payment is negative (i.e., the balance is in favor of the Owner), the Owner shall compensate such amount from any other payment in favor of Contractor, if any, and/or proceed to collect it by any means available.

ARTICLE 14 - PROTECTION OF PERSONS AND PROPERTY

14.1 Public Convenience and Safety

14.1.1. The Contractor shall at all times conduct the Work in a manner that insures the public safety and convenience and the protection of persons and property.

14.1.1.1. Contractor shall perform the Work in a manner that will not cause unreasonable inconvenience to the general public.

14.1.2. The Contractor shall comply with all laws, rules, codes and regulations applicable to the class of work being performed pertaining to public safety and the protection of persons and property.

14.2 Laws to be Observed

14.2.1 It is the Contractor's responsibility to be fully informed of and comply with all Federal, Commonwealth and municipal laws, ordinances, safety codes and regulations, and all such orders or decrees presently in effect or that may be enacted prior to Final Acceptance or which in any way affect the prosecution of the Work.

14.2.1.1. The Contractor shall at all times observe and comply with all such laws, ordinances, safety codes, regulations, orders and decrees; and shall protect Owner and its representatives against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree, whether by himself, his employees, his subcontractors, his suppliers, his agents, or the employees of any of them or by anyone for whom Contractor is responsible.

14.2.1.2. When the United States Government pays all or any portion of the cost of the Work, the federal laws and the rules and regulations pursuant to such laws, if applicable, must be observed by the Contractor, and the Work may be subject to the inspection by any appropriate federal agency.

14.2.2. All costs related to compliance with all laws, rules and regulations enacted after bid opening date, shall be paid for by the Owner and any resulting adjustment to the Contract Price or the Contract Time shall be made by a Change Order to the Contract.

14.2.2.1. If Owner's Representative and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of any such adjustment, a Claim may be made therefore as provided in Article 11.5.

14.2.2.2. Payment under this paragraph is contingent to those situations not covered under Article 14.4.4.

14.3 Sanitary, Health and Safety Provisions

14.3.1. The Contractor shall comply with all Federal, Commonwealth and local laws, rules and regulations concerning construction safety and health standards and shall admit without delay any inspector from such health and safety agencies upon presentation of proper credentials.

14.3.2. Contractor shall provide and maintain in orderly sanitary condition such facilities as necessary for the use of his employees, in compliance with the Commonwealth Departments of Health and Labor and other bodies having jurisdiction.

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14.3.3. The Contractor shall not require work to be performed under unsanitary, hazardous or dangerous conditions.

14.4 Labor Relations and Wages

14.4.1. The Contractor shall comply with all the applicable Federal and Commonwealth laws, rules and regulations concerning fair labor practices including minimum wages, work hours, equal employment opportunities, non-discrimination, civil rights, employment of minors, and other labor relation matters.

14.4.2. The minimum wage rates to be paid shall be according to the regulations of the Minimum Wage Board of the Puerto Rico Department of Labor as indicated in the latest issue of its mandatory decree at any time during the execution of the Project.

14.4.3. The Contractor shall pay weekly, in lawful money of the United States of America, including payment by check or direct deposit, the entire amount of wages, less legally authorized or mandated deductions, earned by each of the laborers and employees engaged in the Work.

14.4.3.1. The Contractor shall make available to the Owner for inspection the project payrolls and shall submit copies of such payrolls to the Owner when required.

14.4.3.2. Any irregularities noted will be brought to the attention of the Contractor by the Owner for appropriate corrective action and payment of any pending wages.

14.4.3.2.1. Should the Contractor fail to take the necessary action, he will be subject to such civil and criminal proceedings provided by law and regulations.

14.4.3.3. Payment of wages to laborers and employees of the Contractor for their work shall have preference over the payment of other debts of the Contractor, except as otherwise established by law.

A 14.4.4. If during the term of the Contract, federal minimum wages are increased and said increase is applied to Puerto Rico, or if labor costs and/or fringe benefits are increased by local legislation, the cost of the increase in the Work shall be considered as a Change Order and proven cost increases, including fringe benefits and insurance costs, shall be paid to the Contractor, unless those increases have been legislated, or included as part of a resolution, by either the Commonwealth or Federal Legislative chambers prior to the bid opening date. If after the bid opening date, new local legislation or regulation is imposed which directly increases Contractor's costs of materials or transportation, the Contractor may present a Claim under Article 11.5 for such increases. Such increases in costs must be evidenced and substantiated by the Contractor.

14.4.4.1. If Owner's Representative and Contractor are unable to agree as to entitlement, amount or extent, if any, of any such adjustment under Article 14.4.4, a Claim may be made therefore as provided in Article 11.5.

14.5 Environmental Protection

14.5.1. Contractor shall comply with all Federal, Commonwealth and local environmental laws and regulations.

14.5.1.1. Contractor shall take all necessary precautions to prevent pollution of streams, lakes, ponds, and reservoirs with fuels, oil, bitumen, chemicals, or other harmful materials and to prevent pollution of the

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atmosphere with particulate or gaseous matter.

14.5.2. Unless otherwise approved in writing by the Owner, construction operations in rivers, streams, lakes and other bodies of water shall be restricted to those areas where channel changes are shown on the plans and to those areas which must be entered for the construction of temporary or permanent structures.

14.5.2.1. Rivers, streams, lakes and reservoirs shall be promptly cleared of all false work, piling, debris, or other obstructions placed therein or caused by the construction operations.

14.5.3. Frequent fording of live streams with construction equipment will not be permitted. Temporary bridges or other structures shall be used wherever an appreciable number of stream crossings are necessary.

14.5.3.1. Unless otherwise approved in writing by the Owner, mechanized equipment shall not be operated in live streams except as may be required to construct channel changes and temporary or permanent structures.

14.5.4. Contractor shall comply with all the requirements regarding soil erosion and water pollution control included in the Environmental Quality Board's regulations, the Owner's other standard specifications, the Plans and other Contract Documents.

14.5.5. If the Contractor should encounter or expose during construction operations any abnormal condition, which may indicate the presence of a hazardous and/or toxic waste, the Contractor shall proceed in accordance with Article 4.7.

14.5.5.1. Abnormal conditions shall include, but shall not be limited, to the following, presence of barrels, discolored earth, metal or wood; obnoxious or unusual odors; visible fumes; excessively hot earth; smoke; or any other condition which appears to be a possible indication of hazardous and/or toxic waste.

14.6 Construction Over or Adjacent to Navigable Waters

14.6.1. All Work and related activity, over, on or adjacent to navigable waters shall be conducted so that free navigation of the waterways will not be interfered with and that the existing navigable depths and clearances will not be impaired except as allowed by permit issued by the U.S. Coast Guard and/or the U.S. Army Corps of Engineers, as applicable.

14.7 Traffic Protection Devices

14.7.1. The Contractor, when applicable, shall provide, erect and maintain all necessary advance warning signs, barricades, suitable and sufficient lights, danger signals, signs, and other traffic control devices; shall provide a sufficient number of watchmen and flag persons, and shall take all necessary precautions for the protection of the Work and the safety of the public in accordance with the plans and other Contract Documents.

14.8 Use of Explosives

14.8.1. When the use of explosives is necessary for the prosecution of the Work, the Contractor shall comply with all the Laws and Regulations concerning the use, storage, transporting, handling and detonating of explosives.

14.8.1.1. The Contractor shall exercise the utmost care with the explosives so as not to endanger life and

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property and he shall be responsible for any and all damages that may result from his use of explosives.

14.8.2. Prior to initiating the use of explosives, the Contractor shall submit to the Owner evidence that his comprehensive general liability insurance required under Article 3 provides coverage for the use of explosives and blasting.

14.8.3. Blasting operations shall be conducted under the most careful and experienced supervision. The Contractor shall keep the Owner informed as to his drilling, blasting and demolition operations.

14.8.4. The Contractor shall furnish and erect special signs to warn the public of his blasting operations.

14.8.4.1. Such signs shall be placed at appropriate points within the Project limits, shall be maintained so as to be clearly evident to the public during all critical periods of the blasting operations and, if blasting is by means of electric detonators, shall include a warning statement to have radio transmitters turned off.

14.8.5. The Contractor shall notify each property owner and public utility company having structures in the proximity to the Site and the Work of his intention to use explosives.

14.8.5.1. Such notice shall be given sufficiently in advance to enable the parties being warned to take steps necessary to protect persons and property from injury.

14.9 Protection and Restoration of Property

14.9.1. The Contractor shall be responsible for the preservation of all public and private property, and shall carefully protect from disturbance or damages all land monuments and property marks until the Owner has witnessed or otherwise referenced their location, and shall not move them until directed.

14.9.2 When the Contractor's excavating operations encounter items of archeological interest such as remains of pre-columbine people's dwelling sites or artifacts of historical, paleontological or archeological significance, operations in the vicinity of such findings shall be temporarily discontinued and the Owner notified.

14.9.2.1. The Owner will contact the proper authorities to determine the disposition thereof.

14.9.2.2. When directed by the Owner, the Contractor shall excavate the site in such a manner as to preserve the artifacts encountered and shall remove them for delivery to the custody of the proper authorities.

14.9.2.2.1. Such specialized excavation and time delay costs, if any, will be considered and paid for as Extra Work unless the Owner elects to undertake such recovery work by other means.

14.9.2.2.2. If the Owner elects to perform this work by other means, he shall be responsible to the Contractor for costs associated with delay to the Work, only if said delay affects the critical path.

14.9.3 Contractor shall be responsible for all damages or injury to property of any character during the prosecution of the Work resulting from any act, omission, neglect or misconduct in the Contractor's manner or method of executing the Work, or at any time due to deficient work or materials. The Contractor's responsibility will not be released until the Project has been completed and accepted.

14.9.4 When any direct or indirect damage or injury is caused to public or private property by or on account of an

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act, omission, neglect or misconduct in the execution of the work, or as a consequence of the non-execution thereof, by Contractor, such property shall be restored at the Contractor's expense to a condition similar or equal to that existing before such damage or injury was caused by repairing, rebuilding or otherwise restoring the same, or Contractor shall make good such damage or injury in a manner acceptable to owner.

14.9.5 Contractor shall comply with all necessary soil erosion and water pollution control measures, as indicated in the Contract Documents, and shall exercise due care in their implementation, to avoid causing erosion and drainage problems in all areas inside and outside the Project construction limits.

14.10 Forest Protection

14.10.1. In carrying out Work or related activity within or adjacent to Commonwealth or National Forests, the Contractor shall comply with all regulations of the Commonwealth Fire Service, Puerto Rico Department of Agriculture, United States Forest Service or other authority having jurisdiction, governing the protection of forests and the carrying out of Work within forests, and shall observe all sanitary laws and regulations with respect to the performance of work in forest areas.

14.10.1.1. Contractor shall keep all areas affected by construction related activities in an orderly condition, dispose of all refuse, obtain permits for the construction and maintenance of all construction camps, stores, warehouses, residences, latrines, cesspools, septic tanks, and other structures in accordance with the requirements of the agency having jurisdiction of the forest.

14.10.2 The Contractor shall take all reasonable precautions to prevent and suppress forest fires and shall require his employees and subcontractors, both independently and at the request of forest officials, to do all that is reasonably within their power to prevent and suppress and to assist in the prevention and suppressing forest fires. They shall make every possible effort to notify a forest official at the earliest possible moment of the location and extent of any fire seen by them.

14.11 Responsibility for Damage Claims

14.11.1. The Contractor shall indemnify and save harmless the Owner as follows:

14.11.1.1. The Contractor for itself, agents, employees, successors and assigns agrees to save harmless the Owner, its Officers, Agents, Employees and Architect/Engineer from and against any and all claims, demands and/or suits, except as stated below, whether judicial or extra judicial for any cost whatever arising out or related to the execution of the Contract, and its insurers shall defend the Owner, its Officers, agents, Employees and Architect/Engineer from such claims, demands and/or suits and shall bear all the expenses for such defense contemplated within the coverage limits provided by the Contractor's general liability policy, except where such claims, demands and/or suits are due solely to the negligence of the Owner, its Officers, Agents, employees and negligence, errors and/or omissions of the work performed by the Architect/Engineer. In case that the amount to be paid exceeds the policy amount, then the Contractor shall be responsible for the exceeding amount.

14.12 Contractor's Responsibility for Work

14.12.1. Until the final written acceptance of the Work by the Owner, the Work shall be under the charge and care of the Contractor. He shall take every necessary precaution to protect it from injury or damage to any part thereof by the action of the elements or from any other cause whether arising from the execution or non-execution of the Work.

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14.12.2. The Contractor shall rebuild, repair, restore and make good any damages to any portion of the Work occasioned by any of the causes indicated in paragraph 14.12.1, above, before its completion and acceptance, and shall bear the expense thereof, except damages to the Work due to unforeseeable causes beyond the control of and without fault or negligence of the Contractor, including but not restricted to acts of God, such as earthquake, hurricane, tidal wave, major flooding or other cataclysmic phenomenon of nature, acts of the public enemy or of the government.

14.12.3. In case of suspension of Work from any cause whatsoever, the Contractor shall be responsible for the Work under the Contract and shall take such precautions as may be necessary to prevent damage to the Project, provide suitable drainage and erect necessary temporary structures, signs or other facilities.

14.12.3.1. During such period of suspension of work, the Contractor shall properly and continuously maintain in acceptable growing conditions all living material in newly established plantings, seeding, and sodding furnished under his contract, and shall take adequate precautions to protect new tree growth and other important vegetative growth against injury.

14.12.3.2. All costs for the work described above attributable to a suspension by the Owner shall be reimbursed to the Contractor by the Owner.

14.12.3.3. If the temporary suspension of Work is caused by the Contractor, then he will bear the expenses in such event.

14.12.4. When Work is suspended by the Contractor without authorization from the Owner, or is suspended by the Owner due to the fault of the Contractor, the costs of providing the protective measures specified in paragraph 14.12.3, above, during the period of suspension shall be borne by the Contractor.

4 14.13 Emergencies

14.13.1. In any emergency affecting the safety of persons or property, the Contractor shall act at his discretion to prevent damage, injury, or loss.

14.13.1.1. Any additional compensation or extension of time claimed by the Contractor on account of emergency Work shall be determined as provided in Article 11. Additional costs incurred by the Contractor in a case of an emergency need not be authorized by the Owner's Representative when there is insufficient time to seek Owner's authorization.

14.13.2. If an emergency affects the safety of persons or property at the Site or property adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Either the Owner or the Contractor can declare an emergency.

14.13.2.1. Contractor shall give Owner's Representative prompt notice if Contractor believes that any significant changes in the Work or variations from what is provided by the Contract Documents have been caused by the emergency or are required as a result thereof.

14.13.2.1.1. If Owner's Representative determines that an amendment to the Contract Price or Contract Time is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive, a Change Order or an Extra Work Order will be issued.

ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION

15.1 Suspension of Work

15.1.1. At any time and without cause, Owner may, with a minimum of seven (7) calendar days written notice, suspend the Work or any portion thereof for a period of not more than ninety (90) consecutive days by notice in writing to Contractor and Architect/Engineer. Said notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be allowed an adjustment in the Contract Price or an extension of the Contract Time, or both, directly attributable to any such suspension if Contractor makes a timely Claim therefore as provided in Article 11.5. Said adjustment shall be computed based on the following factors:

15.1.1.1. Fixed Project expenses (after all reasonable reduction and mitigation of expenses) for the period of the Work stoppage, such as: (i) the Contractor's and subcontractor's supervisory, administrative, and operations personnel salaries, together with their corresponding fringe benefits and insurance costs if this personnel has been kept in the Contractor's payroll and are not gainfully utilized by Contractor or someone else elsewhere, (ii) utilities, (iii) Project's fixed equipment, and (iv) miscellaneous expenses such as safety, and vigilance.

15.1.1.1.1. At any time during the suspension, the Owner may order the Contractor to demobilize, paying the Contractor the de-mobilization costs and any future mobilization costs to re-start the Project.

15.1.1.1.2. Cancellation costs and cost increases for materials already ordered which had to be canceled and reordered, provided that such costs are not in excess of reasonable market prices.

15.1.1.1.3. Differential increases in labor costs, and its corresponding fringe and insurance benefits, in the Project for the period that the work is stopped.

15.1.1.1.4. Construction equipment use costs for the stoppage period if said equipment remains stationed at the site (idle equipment rates), or transportation costs if the Owner orders in writing that it be removed from the site. If the equipment is owned by the Contractor, he will be paid the cost (depreciation) of said equipment.

15.1.1.1.5. Insurance costs whose rates are based on the time such insurance is in effect, such as Builder's Risk Insurance, for the period that the work is stopped.

15.1.1.1.6. Contractor's overhead and profit in the amount equivalent to fifteen percent (15%) of all expenses detailed above.

15.1.1.1.7. An amount of the Contractor's main office overhead costs (exclusively in this instance and solely related to suspension) reached by mutual accord between the parties or if no mutual accord can be reached, the cost for main office overhead shall be computed using the Eichleay formula using as base the previous two (2) years of Contractor's main office overhead cost taken from the previous two (2) years financial statements which have been externally audited by a recognized CPA. If the Contractor does not have financial statements prepared externally by a recognized CPA, he must prepare them in order to be able to present a claim for this purpose.

15.1.1.1.8. Contractor shall exert his best effort to mitigate the costs included in this Article 15.1.1.

UNIFORM GENERAL CONDITIONS FOR PUBLIC WORKS CONTRACTS

15.1.2. At any time, the Owner's Representative may, with a minimum of seven (7) calendar days written notice, for the following causes suspend the Work or part of the Work due to:

15.1.2.1. the repeated and persistence failure of the Contractor to perform his contractual obligations;

15.1.2.2. the repeated and persistent failure of the Contractor to have sufficient labor and the trades necessary to maintain the quality and progress required in the Contract Documents;

15.1.2.3. the repeated and persistent failure of the Contractor to have sufficient material necessary to maintain the quality and progress required in the Contract Documents;

15.1.2.4. the repeated and persistent failure of the Contractor to have sufficient equipment and type of equipment necessary to maintain the quality and progress required in the Contract Documents.

15.1.3. The Contractor will be responsible for all of his costs due the suspension of the Work indicated in Article 15.1.2 and there will be no increase in Contract Price or extension to the Contract Time as a result of such suspension for cause.

15.1.3.1. The suspension for cause under Article 15.1.2 will last until the Contractor remedies the situation or until termination.

15.1.3.2. The Contractor shall also be responsible for the inspection costs made necessary by overtime work to restore the project to its intended schedule due to delays caused by the actions mentioned in Article 15.1.2. Said costs will consist of the actual cost paid therefore by and to the inspector, if his presence is required or necessary.

15.1.4. At any time, the Owner's Representative or the Contractor may suspend the work or part of the work without advanced notice due to any danger or potential danger that may exist to life, limb or property or any emergency whether on the Site or off the Site.

15.1.4.1. The Contractor will be responsible for all of his costs due the suspension and there will be no time extension to the Contract Time if the suspension is due to the failure of the Contractor to perform his contractual obligations.

15.1.4.2. The Owner will compensate the reasonable costs incurred by Contractor if the suspension is due to causes other than the failure of the Contractor to perform his contractual obligations and such causes are attributable to Owner.

15.1.5. In case of suspension of Work for any cause whatsoever, the Contractor shall be responsible for the Work under the Contract and shall take such precautions as may be necessary to prevent damage to the Project, provide suitable drainage and erect necessary temporary structures, signs or other facilities.

15.1.5.1. During such period of suspension, the Contractor shall properly and continuously maintain in acceptable growing conditions all living material in newly established plantings, seeding, and sodding furnished under his contract, and shall take adequate precautions to protect new tree growth and other important vegetative growth against injury.

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15.1.5.2. When Work is suspended by the Contractor without authorization from the Owner, or is suspended by the Owner due to the causes specified in Article 15.1.2, the costs of providing the protective measures specified in Article 15.1.5. and 15.1.5.1, during the period of suspension shall be borne by the Contractor.

15.1.5.3. The Contractor will be responsible for all of its costs due to the suspension and there will be no time extension to the Contract Time if the suspension is due to the failure of the Contractor to perform its contractual obligations, or other causes attributable to Contractor.

15.1.5.4 The Owner will compensate the reasonable costs incurred by Contractor if the suspension is due to causes other than the failure of the Contractor to perform his contractual obligations and such causes are attributable to Owner.

15.2 Owner May Terminate for Cause

15.2.1. The occurrence of any one or more of the following events will justify termination for cause:

15.2.1.1. Contractor's persistent or repeated failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the progress schedule established under the Contract, as adjusted from time to time); or

15.2.1.2. Contractor's egregious disregard of Laws or Regulations of any public body having jurisdiction; or

15.2.1.3. Contractor's persistent or repeated disregard of the authority of Architect/Engineer, Owner or Owner's Representative; or

15.2.1.4. Contractor's persistent and repeated violation of any substantial provisions of the Contract Documents; and does not start curing and without interruption continues to cure same prior to termination.

15.2.1.5. Contractor is adjudged bankrupt, or is a party to a fraud; or

15.2.1.6. Contractor should make a general assignment for the benefit of his creditors; or

15.2.1.7. A receiver be appointed on account of the Contractor's insolvency; or

15.2.1.8. An attachment is made upon a substantial amount the Contractor's properties utilized to perform the Work, and it is not lifted, or the claim otherwise secured, within five (5) working days thereafter; or

15.2.1.9. Contractor persistently fails to make prompt payment to subcontractors, as per Article 6.21.2, or for materials, services, or labor already paid to Contractor by the Owner; or

15.2.1.10. Contractor abandons or discontinues the prosecution of the Work without Owner's written authorization.

15.2.1.10.1 Nevertheless, Contractor may discontinue the prosecution of the Work during: (i) Holy Thursday; (ii) the Friday after Thanksgiving; and (iii) the time period commencing on the Saturday before Christmas Day (December 25) and ending on the Sunday after Three Kings' Day (January 6) without incurring in an event of default due to discontinuance of the Work.

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15.2.2. If one or more of the events identified in Article 15.2.1 occur, Owner may, after giving Contractor (and the surety, if any) seven (7) days written notice to cure such default, terminate the services of Contractor, exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools and appliances at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion), incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and finish the Work as Owner may deem expedient. In such case, Contractor shall not be entitled to receive any further payment until the Work is finished.

15.2.3. In Lump Sum contracts, if the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor.

15.2.4. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Owner's Representative as to their reasonableness and, when so approved by Owner's Representative, incorporated in a Change Order or Extra Work Order. When exercising any rights or remedies under this paragraph Owner shall not be required to obtain the lowest price for the Work performed, but shall assume all reasonable means to complete the work at a reasonable cost.

15.2.5. When Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.

15.2.5.1. Termination of the Contract, as stated above, will not release the Contractor of his responsibilities for the Work completed, nor shall said termination release surety from its obligations.

15.3 Owner May Terminate the Contract For Convenience

15.3.1. Upon seven (7) days written notice to Contractor and Architect/Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, elect to terminate the Contract for convenience.

15.3.2. After receipt of notice of termination for convenience from the Owner, the Contractor shall submit, within sixty (60) calendar days of the effective termination date, a Claim for compensation damages and/or costs. In such Claim, if presented, Contractor shall be paid, without duplication of any items, the following:

15.3.2.1. In lump sum contracts, the work performed and accepted by the Owner shall be paid in accordance with the schedule of values approved by the Owner.

15.3.2.2. The actual cost of all acceptable materials for which orders have been placed by the Contractor for use under this Contract, provided that, if required by the Owner, the Contractor shall make every reasonable effort to cancel such orders. If said orders can be canceled, the Owner shall pay for all restocking, or other charges, associated with said cancellation.

15.3.2.3. The actual cost of acceptable raw material ordered or purchased for fabrication, or materials already fabricated, whether those materials are located in the shop, the project, or in transit.

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15.3.2.4. The actual amounts paid by the Contractor for construction equipment rentals up to the time of termination, plus any amounts accrued, or payable, under written contracts for the rental of such equipment. Contractor shall make every possible effort to cancel any such contracts. In the event that the rental contracts can be canceled by the Contractor, the Owner shall pay for all reasonable costs incurred directly caused by the rental cancellation. If the equipment is owned by the Contractor, he will be paid the cost (depreciation) of said equipment.

15.3.2.5. The actual costs disbursed by to the Contractor of bonds, insurance, taxes, and deposits required under the Contract, unless previously paid by Owner.

15.3.2.6. Contractor's overhead and profit in the amount equivalent to fifteen percent (15%) of all payments made under Articles 15.3.2.2 to 15.3.2.5.

15.3.2.7. Contractor shall exert his best effort to mitigate the costs mentioned in Articles 15.3.2.2 to 15.3.2.5.

15.3.2.7.1. From the total sum of all the costs indicated in Articles 15.3.2.2 to 15.3.2.6. there shall be deducted all payments therefore previously made and all proper charges to the Contractor in relation therewith.

15.3.3. In the event that the Work is suspended under Article 15.1, thereby stopped for a period of time, and after said suspension is cancelled, the amounts due to the Contractor under the Contract will be first calculated for the suspension period as per Article 15.1 hereunder and then calculated for the cancellation afterwards as per Article 15.3, hereunder. The total amount due the Contractor will be the sum of both.

15.3.4. If the Contract is terminated for convenience, the Owner shall assume all security, and insurance of the project on the effective date of the termination, or cancellation.

9 15.3.5. Termination of the Contract for convenience, as stated above, will not release Contractor from his responsibilities for the Work completed, nor shall it release his surety of its obligations.

15.3.6. Contractor shall not be entitled to payment on account of loss of anticipated or expected profits or revenues or other economic loss arising out of or resulting from such termination for convenience under this Article 15.3.

15.4 Contractor's Right to Terminate the Contract

15.4.1. The Contractor has the right to Terminate the Contract and recover from the Owner payment for all work executed as specified in Article 15.3.2, herein, if the Owner:

15.4.1.1. substantially stops the work for any reason whatsoever through no act, or fault, of the Contractor for a period of ninety (90) days starting from the written stoppage notice of the Owner and/or the Owner's Representative, or

15.4.1.2. fails to pay the duly approved Request for Payments within eighty (80) calendar days after the same was due.

15.4.2 The foregoing provisions are in addition to, and not in limitation of the rights of the Contractor under any other provisions of the Contract.

ARTICLE 16 - DISPUTE RESOLUTION

16.1 Disputes

16.1.1. In case of any timely Claim, Dispute or other matter involving the interpretation of the Contract Documents, a change in the Contract Sum, and or an Extension of Contract Time, and other matters in question arising out of, or relating to this Contract or the breach thereof, except for Claims which have been waived by the acceptance of final payment, shall be submitted to and decided first by the Owner's Representative as provided in Article 11.5.

16.1.2. If the Dispute submitted to the Owner's Representative as provided in Article 11.5 is not decided by him within the thirty (30) day period established therein, the Claim shall be deemed rejected.

16.1.3. If the party establishing the Claim is not satisfied with the decision or automatic rejection by the Owner's Representative, the party will have fifteen (15) days to appeal the decision to the Chief of Construction, or equivalent division head, of the Owner.

16.1.4. The Chief of Construction shall have a period of thirty (30) days from the date of receipt of the notice of appeal during which he must render a decision.

16.1.4.1. However, if the Chief of Construction requires additional time to review the Claim, because of the nature or complexity of the Claim or if additional documents and/or information are needed from the Contractor to make a determination, the Chief of Construction shall submit, within five (5) calendar days of receipt of the notice of appeal, a written notice with an estimate of the additional time needed to review said claim and its justification. This additional time, shall not exceed thirty (30) days, unless more time is agreed upon by the parties.

16.1.4.2. If the Chief of Construction does not render a decision within the time allotted, including extensions, then the Claim shall be deemed rejected.

16.1.5. If the Contractor is not satisfied with the decision or automatic rejection by the Chief of Construction, the Claim shall be referred to the Owner and the Contractor. The parties will meet for negotiations within ten (10) working days of the notice of referral of said Claim. If the Dispute has not been resolved within thirty (30) days after said referral (which may be extended by mutual agreement) and subject to any rights to injunctive relief and unless otherwise specifically provided for herein, the parties shall proceed in accordance with Article 16.2.

16.1.6 Contractor shall carry on the Work and adhere to the progress schedule during all Disputes or disagreements with Owner. The Owner will continue making payments under the Contract for Work performed that is not in Dispute.

16.1.7. No Work shall be delayed or postponed pending resolution of any Disputes or disagreement unless Owner and Contractor otherwise agree in writing.

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16.2 Remedies

16.2.1. All Disputes not resolved by the method indicated in Article 16.1, upon written agreement of the parties, shall be submitted to non-binding mediation as indicated in Article 16.3. Either party may, at any time, give written notice to the other party that it does not wish to mediate or to continue to mediate a Dispute. Such notice shall conclude the mediation process.

16.2.2. If the parties fail to agree to submit the Dispute to mediation, or one party decides to cancel the mediation after the mediation has started, or if the mediation process does not resolve all Disputed matters, then the remaining Disputes shall be decided by arbitration, upon timely demand for arbitration, notified by one party to the other within ten (10) days after the mediation process has concluded, if the amount of the claim does not exceed the limits established in Article 16.4.1. The mediation process shall conclude on the date notice is delivered by one party to the other stating that the party does not wish to mediate or to continue to mediate. Any undecided Disputes that exceed the limits established in Article 16.4.1, will be decided by the General Court of Justice of Puerto Rico.

16.3 Mediation

16.3.1. If the parties agree to mediate the Dispute they may chose between:

16.3.1.1. a mutually agreed mediation procedure; or

16.3.1.2. a mediation procedure under the supervision of the Bureau of Claim Resolution by Alternate Methods the Office of the General Court of Justice; or

16.3.1.3. a mediation procedure administered by the American Arbitration Association under its Construction Industry Mediation Rules.

16.3.2. All costs incurred as a result of the mediation shall be borne equally by the parties, unless the mediator orders otherwise in accordance to Article 16.3.4.

4 16.3.3. The parties will be required to exchange their positions as to the Dispute, fully and in good faith, with a detailed description of the facts and of the applicable law and shall fully exchange supporting documents. If after agreeing to mediate a Dispute a party is substantially unprepared to participate in the proceedings, or fails to participate in good faith, the Mediator at his discretion may require said party to pay all or part of the costs of the mediation incurred by the other party due to the non-compliance with this Article.

16.4 Arbitration

16.4.1. Disputes to be arbitrated shall be limited to those Disputes, which when all sums claimed therefore under the Contract are added, total an aggregate sum of five percent (5%) or less of the Contract Price or \$500,000.00 or less, whichever is lower. Only such Disputes where the aggregate amount claimed is below said threshold shall be resolved through the arbitration procedures established in this Article 16.4. The aggregate sum shall be determined on the date of the notice of the demand for arbitration taking into consideration all pending Disputes regarding the Contract submitted by the Contractor pursuant to Articles 11.5 and 16. In order to qualify for resolution thru arbitration, all issues and Claims regarding liability and damages relating to a particular Dispute must be submitted together, within the same arbitration proceeding. The parties are specifically prohibited from submitting the issue of liability to arbitration and thereafter submitting the issue of damages (regarding the same Dispute) to another arbitration proceeding or to the court.

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16.4.1.1. The \$500,000.00 threshold will be adjusted every five (5) years. The adjustment will be based on the Consumer Price Index (CPI) published by the Government of Puerto Rico. The base year for such adjustment shall be the year 2010.

16.4.1.2. If Contractor invokes the provisions of this Article 16.4, but at a later date submits additional Claims to the Owner under the same Contract, pursuant to Article 11.5 and/or Article 16, for an additional sum which, if added to the amount claimed under the original Dispute(s), surpasses the threshold amount established in Article 16.4.1, then said additional Disputes that surpass the threshold may not be submitted to arbitration and shall be decided by the General Court of Justice of Puerto Rico. Nevertheless, the already pending arbitration proceedings under Article 16.4 shall continue until concluded. If additional Disputes are submitted after the arbitration proceedings are concluded and final award has been entered, then the amounts of the original Claims that were arbitrated and concluded shall not count towards the threshold stated in Article 16.4.1.

16.4.2. Procedure For Binding Arbitration.

16.4.2.1. Contractor shall submit to the Owner, together with the notice of demand for arbitration of a Dispute, a list of no less than five (5) proposed arbitrators, together with their respective curriculum vitae and a disclosure statement from each as to possible conflicts of interest.

16.4.2.2. Within five (5) working days of receipt of the notice of demand for arbitration, Owner shall either: (i) select one (1) arbitrator from the Contractor's list, or (ii) if all arbitrators proposed by Contractor are unacceptable to Owner, submit to Contractor a list of no less than five (5) proposed arbitrators, together with their respective curriculum vitae and a disclosure statement from each as to possible conflicts of interest.

16.4.2.3. Within five (5) working days of receipt of the Owner's list, contractor shall either: (i) select one (1) arbitrator from such list or (ii) reject all arbitrators from the Owner's list. If within the following ten (10) days the parties cannot agree as to an arbitrator or a panel of arbitrators, then each party within the following five (5) days will unilaterally appoint and notify to the other one arbitrator, and the two (2) arbitrators so appointed shall within ten (10) days after the appointment of both arbitrators select a third arbitrator and notify the Owner and the Contractor of said selection, and the three (3) arbitrators shall constitute the panel of arbitrators that shall decide the Dispute. The arbitrators so appointed or selected need not be on the original lists of arbitrators. Within ten (10) days of the selection of the third arbitrator, each arbitrator shall notify Owner and Contractor their respective curriculum vitae and statement as to possible bias or conflict of interest.

16.4.2.4. The arbitration proceedings shall be conducted under the provisions of the Puerto Rico Arbitration Act, Act No. 376 of May 8, 1951, as amended.

16.4.3. Award

16.4.3.1. The award entered need not include written determinations of fact and conclusions of law and the award shall be final and not be reviewable or appealable due to errors of fact or of law. Nevertheless, the arbitrators will endeavor to ascertain the facts and follow the law.

ARTICLE 17 - MISCELLANEOUS

17.1 Governing Law. The Contract Documents, and all questions relating to their validity, performance, interpretation and enforcement, shall be governed by and construed in accordance with the laws of the

UNIFORM GENERAL CONDITIONS FOR PUBLIC WORKS CONTRACTS

Commonwealth of Puerto Rico. Any legal action brought concerning the above shall be brought in accordance with the contract and thereafter exclusively in the courts of the Commonwealth of Puerto Rico.

17.2 Federal Funds

17.2.1. When the United States government or any of its agencies finances or pays for all or any portion of the cost of the Work, federal laws and the applicable rules and regulations must be observed by the Contractor. The Owner will identify in the bid documents the program providing such funds.

17.2.2. If the Contract Documents include a specific provisions issued by such federal funding agency in case of conflict with other provisions of the Contract Documents, said federally issued provisions shall govern.

17.2.3. Unless specified elsewhere in the Contract Documents, the funding federal agency is not a party to this Contract.

17.2.4 When the United States government funds Work covered by the Contract Documents, the Work shall be under the supervision of the Owner but subject to the inspection by the appropriate Federal agency and in accordance with the applicable Federal statutes and rules and regulations.

17.2.4.1. Such inspection shall in no way make the Federal Government a party to this Contract and will in no way interfere with the rights of either party hereunder.

17.2.4.2. The Contractor shall extend the same courtesies to the representatives of the Federal government as required to be extended to representatives of the Commonwealth government.

17.3 Notice

17.3.1. Unless otherwise specified in the Agreement or in the Contract Documents, written notice shall be deemed to have been duly served if delivered:

17.3.1.1. to Contractor if delivered in person to the individual, to a member or partner of the firm or entity, or to an officer of the corporation for which it was intended; or if delivered at, or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice.

17.3.1.2. to Owner if delivered in person to the Owner's Representative or to the Project Inspector; or if delivered at, or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice with the requirements established in Article 17.3.2.

17.3.2. All notices whereby a consent, approval or action is required to be performed by the recipient within a specific period shall include, in bold and capitalized font, at the top of the transmittal communication the following legend: "IMPORTANT RIGHTS MAY BE LOST BY FAILURE OF [NAME OF PARTY] TO ACT PROMPTLY. SPECIFIC ACTION(S) AND/OR APPROVAL(S) ARE HEREIN REQUESTED. IN CASE OF AUTOMATIC APPROVAL DUE TO FAILURE TO ACT BY THE RECIPIENT THE NOTICE MUST STATE: THIS SUBMISSION WILL BE DEEMED APPROVED _____ BUSINESS DAYS AFTER RECEIPT BY [NAME OF PARTY] IF REJECTION IS NOT NOTIFIED TO [NAME OF SENDER]."

17.4 **Computation of Time.** When a period of time is to be computed for any purposes under the Contract Documents, the number of days within such period will exclude the first and include the last day. If the last day of

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any such period falls on a Saturday, a Sunday or on a Holiday listed in Article 1.1.1.41, such day will be excluded from the computation.

17.5 Ownership of Documents. Any reports, information, findings, data, or any other documents prepared or assembled by the Contractor regarding the Contract will be the sole property of the Owner and shall not be made available by Contractor to any individual or organization without the prior written approval of the Owner, unless required by court order.

17.6 Personal Liability of Public Officials. In exercising rights or carrying out duties under the Contract, the Owner's Representative, the Contracting Officer, and their authorized representatives shall not be personally liable, it being understood that they act as the agents and representatives of Owner.

17.7 No Waiver of Legal Rights

17.7.1. In Unit Price Contracts, the Owner shall not be precluded or stopped by any measurement, estimate, or certificate made either before or after the completion and acceptance of the Work (and payment made therefore), from showing the true amount and character of the Work performed and materials furnished by the Contractor, nor from showing that any such measurement, estimate or certificate is untrue or is incorrectly made, nor from showing that the work or materials do not in fact conform to the Contract.

17.7.2. The Owner shall not be precluded or stopped, notwithstanding any such measurement, estimate or certificate and payment in accordance therewith, from recovering from the Contractor or his sureties, or both, such damage as Owner may have sustain by reason of his failure to comply with the terms of the Contract. Neither the acceptance by the Owner or any representative of the Owner nor any payment for or acceptance of the whole or any part of the Work, nor any extension of time, nor any possession taken by the Owner, shall operate as a waiver by Owner of any right hereunder.

17.7.3. A waiver by the Owner, or Contractor, of any breach of the Contract shall not be held to be a waiver as to any other breach.

17.7.4. The Contractor, shall be liable to the Owner for latent defects, fraud, (or such gross mistakes as may amount to fraud), and every contractual warranty or guaranty.

17.8 Cumulative Remedies. The duties and obligations imposed by these General Conditions and the rights and remedies available thereunder are in addition to, and are not to be construed in any way as a limitation of any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents, and the provisions of this Article will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

17.9 Successors and Assigns. The Owner and the Contractor each binds himself, his partners, successors, assigns and legal representatives to the other party hereto and to the partners, successors, assigns and legal representatives of such other party in respect to all covenants, agreements and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract or sublet it as a whole without the written consent of the other, nor shall the Contractor assign any moneys due or to become due to him hereunder, without the previous written consent of the Owner.

17.10 Survival of Obligations. All representations, indemnifications, warranties, and guarantees made in,

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required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work and termination or completion of the Agreement.

17.11 Language. These Uniform General Conditions were enacted by the Secretary and approved by the Governor of Puerto Rico in the English language, according to the Legislative authorization found in Law No. 1 of January 28, 1993.

17.12 Amendments. These Uniform General Conditions shall be amended whenever the Secretary deems it necessary in order to fulfill its purpose.

PART C. ADDITIONAL PROVISIONS

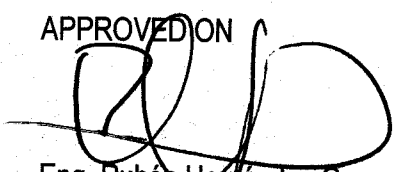
ARTICLE 1: SEPARABILITY CLAUSE; EFFECTIVENESS

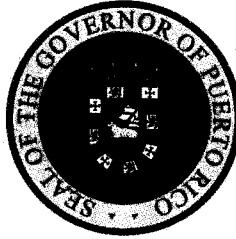
1.1 Separability Clause. If any provision authorized in these regulations is declared unconstitutional or void by a Court of Competent jurisdiction, the remaining provisions of this Uniform General Conditions shall continue in effect.

1.2 Effectiveness. These Uniform General Conditions shall enter into effect thirty (30) days after having been filed and enacted by the Department of State, except with regard to Contracts whose Contract Price is paid by one or more Federal Agency in which case these Uniform General Condition, with regard to such Contracts, shall enter into effect immediately after said Federal Agencies, which provide such funds, consent in writing to their use as part of the Contract Documents. At the time of said effectiveness and from that moment forward, general conditions used and issued by a government agency, department, public corporation and instrumentality, may no longer be validly incorporated in Contracts for public works, with the exception of these Uniform General Conditions.

APPROVED ON

February 22, 2011, IN SAN JUAN, PUERTO RICO.


Eng. Rubén Hernández Gregorat, MEM, PE
Secretary
Department of Transportation and Public Works



GOVERNMENT OF PUERTO RICO

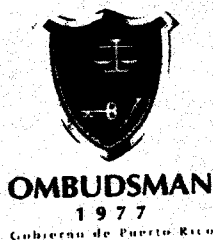
CERTIFICATION

Pursuant to Law No. 198 of May 15, 1943, as amended, and Law No. 1 of January 28, 1993 and after compliance with the Puerto Rico Uniform Administrative Procedure Act, Law No. 170 of August 12, 1988, as amended, I hereby approve the final version of the Uniform General Conditions for Public Contracts of the Government of Puerto Rico, as prepared by the Secretary of Transportation and Public Works and submitted for my consideration on February 22, 2011.

In San Juan, Puerto Rico, this 23rd -day of February of 2011.

A handwritten signature in black ink, appearing to read "Luis G. Fortuño".

Luis G. Fortuño
Governor



OFICINA DEL PROCURADOR DEL CIUDADANO

Hon. Iris Miriam Ruiz Class
Procuradora

8 de febrero de 2011

Hon. Rubén A. Hernández Gregorat
Secretario
Departamento de Transportación y Obras Públicas
PO Box 41269
San Juan, Puerto Rico 00940-1269

Re: **NEG-11-00061**
Proyecto de Condiciones Generales Uniformes para Obras Públicas

Estimado secretario Hernández Gregorat:

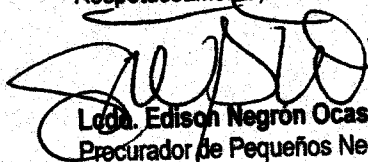
La Procuraduría de Pequeños Negocios, luego de analizar y hacer varias recomendaciones para el **Proyecto de Condiciones Generales Uniformes para Obras Públicas**, presentado por el Departamento de Transportación y Obras Públicas, entiende que el mismo no tiene impacto sustancial que pueda afectar a los pequeños negocios.

Por otra parte, le recordamos que el Artículo 5 de la Ley Núm. 454 del 28 de diciembre de 2000, según enmendada, Ley de Flexibilidad Administrativa y Reglamentaria para el Pequeño Negocio (LFAR), impone a las agencias a deber de hacer públicas las copias del Análisis de Flexibilidad Reglamentaria en el Registro de Reglamentos del Departamento de Estado.

La falta de publicación del Análisis de Flexibilidad podría inducir que cualquier asociación de comerciantes y/o dueño de negocio radique en el Tribunal la impugnación del reglamento por no cumplir con los aspectos procesales establecidos en la LFAR. Este tipo de acción judicial requeriría que el pequeño negocio demuestre al Tribunal el impacto negativo que le puedan causar tanto el nuevo reglamento como la falta de un Análisis de Flexibilidad. El término para impugnar el referido reglamento es de un (1) año a partir de la fecha en que el mismo entre en vigor.

Por lo cual, la Procuraduría de Pequeños Negocios da un aval condicionado al reglamento propuesto y exhorta que el nuevo reglamento sea promulgado cumpliendo con todas las disposiciones en ley. Le exhortamos también a comunicarse con nuestra Procuraduría de tener alguna duda al respecto.

Respetuosamente,



Leda Edison Negrón Ocasio
Procurador de Pequeños Negocios

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**GOBIERNO DE PUERTO RICO
DEPARTAMENTO DE TRANSPORTACIÓN Y OBRAS PÚBLICAS**

**ANALISIS DE FELIXIBILIDAD ADMINISTRATIVA Y REGLAMENTARIA
PARA PEQUEÑOS NEGOCIOS**

UNIFORM GENERAL CONDITIONS FOR PUBLIC WORKS CONTRACTS

10 DE DICIEMBRE DE 2010

ANÁLISIS SOBRE FLEXIBILIDAD ADMINISTRATIVA Y
REGLAMENTARIA PARA PEQUEÑOS NEGOCIOS

UNIFORM GENERAL CONDITIONS FOR PUBLIC WORKS

I. BASE LEGAL, NECESIDAD Y OBJETIVOS DEL REGLAMENTO PROPUESTO

A. Base legal y necesidad de adoptar reglamentación

La Ley Núm. 198 del 15 de mayo de 1943, según enmendada, 22 L.P.R.A. §59, et seq., autorizó y ordenó al Secretario de Transportación y Obras Públicas preparar un pliego de condiciones generales para la contratación de obras públicas en Puerto Rico. Mediante esta Ley se creó el marco jurídico aplicable a la contratación de toda obra pública y se estableció un procedimiento para su promulgación.

Habiendo transcurrido ya varios años desde la aprobación del último pliego de condiciones generales, el Departamento de Transportación y Obras Públicas (DTOP) y la Autoridad de Acueductos y Alcantarillados (AAA), con el insumo y cooperación del Asociación de Contratistas Generales (AGC), Capítulo de Puerto Rico, se dieron a la tarea de confeccionar un nuevo pliego de condiciones generales mediante el cual se pretendió cobijar uniformemente a todas las agencias gubernamentales que realizan obra pública, además de crear unas nuevas reglas que se atemperaran a la experiencia adquirida colectivamente por las distintas agencias gubernamentales a través de años de contratación.

Para canalizar el proceso y poder alcanzar las metas resultó indispensable enmendar la referida Ley Núm. 198. A estos efectos se preparó un ante proyecto de Ley el cual luego de ser evaluado por distintas Comisiones (Comisión de Gobierno, Urbanismo e Infraestructura) y aprobado por el Senado y la Cámara de Representantes, fue aprobado por el Gobernador, convirtiéndose en la Ley Núm. 131 del 2 de septiembre de 2010.

Las enmiendas que trajo la referida Ley 131 fueron, en esencia, las siguientes:

- (a) la actualización de conceptos contenidos en la Ley 198 para conformarlos a la realidad jurídica actual;
- (b) la inclusión de disposiciones específicas para establecer que el Pliego de Condiciones Generales Uniformes regiría las relaciones contractuales en la construcción de toda obra pública que realicen las agencias, departamentos, corporaciones públicas y demás instrumentalidades gubernamentales con excepción de los Municipios; y
- (c) disponer que el proceso de aprobación de las condiciones generales uniformes se haría de conformidad con las disposiciones de la Ley de Procedimiento Administrativo Uniforme, Ley Núm. 170 de 12 de agosto de 1988, según enmendada.

Las enmiendas realizadas a la Ley 198 sentaron las bases legales que permiten la aprobación de este pliego de Condiciones Generales Uniformes.

La contratación, coordinación y supervisión de obras públicas presenta problemas y situaciones de carácter recurrentes tanto para las agencias como para los contratistas. Para atender estos problemas era necesaria la creación y aprobación de un conjunto de disposiciones que especificaran cuales son las responsabilidades, obligaciones y poderes de cada una de las partes contratantes y sus competencias en los campos de actuación respectivos.

B. Propósito del reglamento

El Pliego de Condiciones Generales Uniformes pretende uniformar la contratación y administración de toda la obra de construcción pública en Puerto Rico y eliminar el desfase que existe en la contratación en las diferentes agencias. Por ser el resultado de un esfuerzo común y de la experiencia de las partes contratantes, el nuevo pliego de Condiciones Generales Uniformes busca proveer soluciones o avenidas de acción a problemas contractuales, administrativos y legales comunes o similares y sirve de instrumento para nivelar el terreno para todas las partes de manera que se protejan adecuadamente los intereses de cada uno de los contratantes.

II. APLICABILIDAD

Las disposiciones contenidas en el Pliego de Condiciones Generales Uniformes son de aplicación a cualquier persona natural o jurídica que suscriba un contrato con cualquier agencia de gobierno, departamento, corporación pública o cualquier instrumentalidad del Gobierno de Puerto Rico en el cual el objeto del contrato sea la consecución de obra pública. Sin embargo, las Condiciones Generales Uniformes no sólo son de aplicación al contratista principal de la obra que contrata con una agencia sino que existen clausulas que son aplicables a los subcontratistas y materialistas que trabajan en dicha Obra. El trabajo que un subcontratista o suplidor realice para el contratista general del Proyecto deberá ser de conformidad a un acuerdo en el que se le obligue al Subcontratista a cumplir con los términos y condiciones de seguridad, y otros de las Condiciones Generales y de los Documentos Contractuales que le sean aplicables.

III. POSIBLES IMPACTOS DE LA REGLAMENTACIÓN

A. Pequeños negocios impactados

Este Reglamento tiene un impacto en toda entidad que contrate para la ejecución de una obra pública sin importar el tamaño que tenga esa operación comercial. El factor determinante no es el tamaño del negocio sino el objeto del contrato, o sea que el contrato conlleve la ejecución de una obra pública incluyendo pero sin limitarse a trabajos de construcción, restauración y reparación de edificios o construcciones existentes o nuevas, así como la conservación y mantenimiento de los elementos construidos y los proveedores de diferentes servicios contratados para trabajar en Obras.

Para que un contratista principal pueda hacer negocios con el Gobierno Federal de Los Estados Unidos y con el Gobierno de Puerto Rico este debe estar inscrito en el Registro Único de Licitadores. Este requisito no es de aplicación a los sub-contratistas y materialistas del contratista principal del Proyecto ya que la relación contractual de los materialistas o subcontratistas no es con el gobierno o la agencia, sino que su relación contractual es con el Contratista Principal. El Registro de Licitadores o proveedores le brinda la oportunidad legítima a las corporaciones o entidades de participar del proceso de compra gubernamental "procurement" y la participación de las subastas como contratista principal. En Puerto Rico existen varios

registros de licitadores o proveedores siendo el más importante el Registro Único de Licitadores que es dirigido por la Administración de Servicios Generales (ASG). Este Registro es respaldado por la Ley 85 de Junio 2002, mejor conocida como "Ley Registro Único de Licitadores". Uno de los propósitos principales de este Registro es que el Gobierno puede asegurarse de lo siguiente: Adquirir bienes y servicios de empresas que cumplan con todas las requisiciones fiscales; Contratar empresas bonafides debidamente autorizadas para hacer negocios en Puerto Rico; Contratar Individuos que estén al día en sus obligaciones fiscales; Contratar individuos y empresas que cumplan con solvencia ética y moral; Contratar empresas que puedan cumplir con los bienes o servicios solicitados.

Muchos de los contratistas registrados en el Registro Único de Licitadores no cualifican como pequeños negocios ya que emplean a más de quince (15) personas, por tanto estos contratistas, aunque están impactados por el Reglamento de Condiciones Generales Uniformes, no están dentro del marco de los negocios cubiertos por este análisis. No empecé lo anterior, existen algunos contratistas que sí cualifican como pequeños negocios, estos contratistas en su mayoría son corporaciones dedicadas a proyectos de construcción que envuelven construcción de carreteras, puentes edificios y otros. Por otro lado, los subcontratistas y materialistas de los proyectos de construcción de obra pública si son usualmente pequeños negocios, sin embargo, a estos no les aplica el requisito de pertenecer al Registro Único de Licitadores pues su relación contractual no es con el gobierno o la agencia sino con el contratista general de la obra.

A pesar de no requerir que el sub contratista pertenezca al registro único de licitadores las Condiciones Generales Uniformes si establecen que el dueño podrá objetar la contratación de un subcontratista o materialista si existen razones validas. Las Condiciones Generales Uniformes le requieren al Contratista Principal de la obra presentarle al gobierno o agencia con la cual contrata un listado en el que se detallen el nombre de los subcontratistas y materialistas principales que pretende utilizar en las porciones principales del Proyecto. Por su parte la agencia o gobierno tiene el deber de investigar y notificar al Contratista si objeta alguno de los subcontratistas o suplidores contenidos en la lista provista por el contratista principal. La objeción por parte de la agencia no podrá ser arbitraria, la misma deberá ser una razonable y los fundamentos para la misma deberán constar por escrito. Las causas para objetar a un subcontratista, suplidor o materialista pueden incluir, entre otras: record de incumplimientos previos de un subcontratista o materialista con la agencia, record flagrante de violaciones de seguridad o desempeño insatisfactorio en pasados Proyectos con la agencia. Este procedimiento tiene el propósito de garantizar algún control sobre los contratistas o suplidores de Proyectos de manera que se evite que subcontratistas o materialistas ineficientes y de alto riesgo trabajen en la obra retrasándola y aumentando los costos los cual al fin y al cabo termina siendo pagado con fondos públicos. Por ende, esta es una medida de control que pretende asistir a la mejor utilización de fondos públicos.

B. Impacto económico al pequeño negocio

Las Condiciones Generales Uniformes son el resultado de un esfuerzo interagencial dirigido por el DTOP y la AAA, agencias que por su vasta experiencia en la contratación de obras públicas tomaron la iniciativa de crear un conjunto de disposiciones que regularan y uniformaran la contratación de Obra. Durante la redacción de las Condiciones Generales Uniformes se contó con la participación y colaboración activa de la ACG, Capítulo de Puerto Rico. La ACG es una asociación que agrupa a más de 350 compañías que generan un 80% de la construcción en nuestra Isla. Entre los propósitos y objetivos de la ACG se encuentra el combatir las prácticas injustas, apoyar al contratista y sus asociaciones para verificar condiciones insatisfactorias y estimular métodos de contratación que no expongan al contratista a riesgos.

El proceso de redacción de la Condiciones Generales Uniformes incluyó la celebración de innumerables reuniones para la discusión de las disposiciones. En dichas reuniones las partes presentaban sus posiciones en cuanto a cada disposición. Por ende el borrador que resultó del ejercicio contó con la aprobación del ACG. Debido a que la participación de la ACG en este proceso fue esencial para la redacción de las Condiciones Generales Uniformes, los derechos de los contratistas al igual que impacto económico de estas condiciones generales fueron escuchados para que dicho impacto a los contratistas fuera mínimo.

No obstante, por tratarse de fondos públicos que van a ser desembolsados para la construcción de obras públicas, el Gobierno tiene que tener unas garantías de que dicho dinero será invertido de manera eficiente. Por tal razón siempre que la agencia suscribe un contrato con un contratista general para construcción de obra pública a este se le requiere la prestación de ciertas fianzas y seguros que garanticen que los fondos resultaran en la construcción de la obra. Las Condiciones Generales Uniformes también exigen la prestación de estas garantías, sin embargo, las mismas fueron redactadas para nivelar el campo del juego y salvaguardar los derechos de todas las partes envueltas.

C. Zonas geográficas de mayor impacto

Las disposiciones de las Condiciones Generales Uniformes impactan directamente a los contratistas principales que contratan con el gobierno o agencia. Estos contratistas, los cuales tienen que ser licitadores autorizados, se encuentran ubicados a través de todo Puerto Rico. Las estadísticas de la ASG demuestran que la mayoría de los licitadores autorizados se encuentran ubicados en la zona metropolitana. Sin embargo, como mencionamos anteriormente la mayoría aunque no todos estos contratistas principales no se consideran pequeños negocios. La mayoría de los pequeños negocios que están en alguna manera impactados por la Condiciones Generales son los subcontratistas, suplidores o materialistas los cuales se encuentran distribuidos por toda la Isla aunque en su mayoría también están ubicados en el área metropolitana.

IV. CUMPLIMIENTO CON EL REGLAMENTO

A. Personal que fiscalizará su cumplimiento

El personal encargado de hacer cumplir las disposiciones Condiciones Generales Uniformes consiste de los funcionarios de las agencias o instrumentalidades de gobierno contratantes que están a cargo de la contratación, supervisión y sobresseimiento de la construcción de la obra.

B. Sanciones y penalidades

El incumplimiento con las disposiciones del Reglamento de Condiciones Generales Uniformes puede conllevar la imposición de daños líquidos, cancelación de contratos, radicación de demanda por incumplimiento, imposición de multas y cancelación de autorizaciones o licencias.

Las Condiciones Generales Uniformes disponen que en caso de que el contratista o su aseguradora no completen el trabajo dentro del tiempo especificado por el contrato o según extendido se le impondrá al contratista una suma de daños líquidos por cada día calendario que el trabajo no sea completado en tiempo. Los daños líquidos fluctúan desde \$300.00 dólares diarios en Contratos de \$0 hasta \$99,999.99 hasta \$8,000.00 diarios en proyectos de \$50 Millones en adelante (aunque esto puede variar según la

Provisión Especial que se incluya en el contrato. Por otro lado, las Condiciones Generales Uniformes también disponen de un incentivo equivalente a la mitad de los daños líquidos estipulados por cada día que la obra este sustancialmente completada antes de la fecha de terminación estipulada en el Contrato.

Lo anterior no impide que el Gobierno de Puerto Rico pueda, por los mismos hechos, iniciar un procedimiento criminal contra cualquier contratista que se identifique que ha cometido delitos relacionados con fraude en la construcción o cualquier otro delito tipificado en el Código Penal de Puerto Rico.

C. Otros requisitos para cumplimiento

Las Condiciones Generales Uniformes son un conjunto de disposiciones que definen los deberes y derechos del contratista principal y de las agencias en el proceso de contratación y construcción de obras públicas. Estas Condiciones Generales Uniformes también disponen los términos para actuar o presentar reclamaciones. Debido a su carácter regulador las Condiciones Generales Uniformes establecen múltiples requisitos a los contratistas a quienes se les adjudica la construcción de una obra pública y discutirlos todos sería vertir el contenido de las condiciones generales en este escrito. Sin embargo, entendemos que los requisitos más significativos en cuanto al impacto económico del Reglamento en aquellos pocos contratistas principales que cualifican como pequeños comerciantes es el asunto de la obtención de las fianzas y pólizas de seguros requeridas en el Artículo 3 de las Condiciones Generales Uniformes.

La Condiciones Generales Uniformes disponen que el contratista principal que haya recibido la buena pro en una subasta y contraté con el gobierno o agencia para la construcción de una obra pública no podrá comenzar trabajos hasta no haber obtenido ciertas pólizas de seguros y fianzas requeridas en las Condiciones Generales Uniformes. En el caso de las agencias que no tienen un "Owner's Controlled Insurance Program" el contratista principal de la obra deberá, dentro de los diez (10) días de haber recibido la notificación de adjudicación de subasta, proveer lo siguiente: (1) fianza de pago y fianza de cumplimiento en una suma de al menos 50% hasta 100% del monto del contrato; (3) pólizas del Fondo de Seguro de Estado y todas las pólizas de seguros social y laborales necesarias; (4) seguro de responsabilidad general; (5) póliza choferil para negocios; (6) builders risk; (7) installation floater policy; (8) "contractors liability insurance" con un límite agregado general de \$1 Millón, límite agregado de productos o operación de \$1,000.00, límite de "advertising and injury", límite por ocurrencia de \$5,000,000.00 límite de daños por fuego \$50,000.00 límite de gastos médicos de \$5,000.00. Estos requisitos son aplicables al contratista general porque su relación contractual es con la agencia pero no al subcontratista o suplidor ya que relación contractual es con el contratista general. A pesar de lo antes expresado al subcontratista le aplican algunas clausulas de las condiciones generales sobre calidad de trabajo, seguridad y otros relacionados al trabajos que contrate.

Otro requisito de impacto económico para aquellos contratistas generales que sean pequeños negocios es que el contratista general vendrá obligado al pago de todos los impuestos incluyendo impuesto de ventas, consumo, uso y otros de carácter similar necesarios para la consecución de de la Obra. Estos impuestos deben pagarse de acuerdo con las leyes, reglamentos y ordenanzas del lugar donde ubique la Obra que sean aplicables durante el periodo en de duración de la Obra y que estuvieran en efecto al momento de la subasta. Estos impuestos incluyen los impuestos municipales. Véase Art. 6.10.

Las pólizas de seguros y fianzas así como los impuestos y otros costos son gastos que el contratista general toma en consideración al momento de someter su propuesta ante la agencia o sea al momento de

licitar. Por tanto, estos gastos se encuentran absorbidos en el precio de licitación que el contratista general somete, a saber, en el Precio del Contrato. Los requisitos para las diferentes fianzas y seguros tienen el propósito de garantizarle a la agencia que el contratista principal será responsable. Estas disposiciones garantizan la ejecución de la obra y la mejor utilización de los fondos públicos que se desembolsan para pagar la Obra.

Por otro lado el impacto que tiene el Reglamento de Condiciones Generales Uniformes en los subcontratistas, materialistas y suplidores no es un impacto de carácter económico sino un impacto de carácter regulatorio ya que algunas disposiciones de las Condiciones Generales Uniformes como las de seguridad y otras que no son las de fianzas se incorporaran a los contratos que estos suscriben con el contratista general.

V. RELACIÓN CON OTROS REGLAMENTOS

Este Reglamento guarda relación con todos los reglamentos relacionados a las subastas, compras y contrataciones en obras de gobierno y con la ley y reglamentación de agencias federales que proveen subsidio a varias obras, este Reglamento deberá contar con la anuencia de esas agencias federales. Por tal razón las agencias que reciben ayuda federal notificarán el reglamento a las agencias federales concernidas y obtendrán su posición en cuanto al mismo.

VI. SEÑALAMIENTOS DEL PROCURADOR DE PEQUEÑOS NEGOCIOS

Los representantes del Departamento de Transportación y Obras Publicas se reunieron con el Procurador de Pequeños Negocios y el personal que analizó las disposiciones del propuesto Reglamento con el propósito de recibir el insumo y recomendación del Procurador y discutir y aclarar dudas sobre las cláusulas del Reglamento. Las partes discutimos la sección 3.2.1. y 3.2.2 del propuesto Reglamento. Estas Cláusulas en esencia requieren (i) que el contratista principal provea lo siguiente antes de dar comienzo a la obra: (1) fianza de cumplimiento; (2) fianza de pago; (3) póliza de compensación a trabajadores; (4) Fondo de Seguro de Estado y seguro social; (5) Seguro de Responsabilidad General; (6) Póliza de Chóferil; (7) Builders Risk; (8) Installation Floater (cuando sea aplicable); y (ii) que el contratista le conceda a las agencias y al gobierno discreción para eximir o solicitar pólizas o seguros de otra naturaleza a las antes mencionadas, según lo entienda necesario. Luego de analizar las disposiciones del Reglamento sobre este particular y atender las preocupaciones determinamos que la discreción que el Reglamento le concede a la agencia es razonable y necesaria. La cláusula que permite se exima de algunas pólizas o seguros o que se requieran pólizas o seguros adicionales (sección 3.2.2) ya había sido previamente considerada y discutida el AGC. Precisamente con el propósito de atender la preocupación de posibles decisiones arbitrarias por parte de las agencias en cuanto a eximir o requerir más seguros se creó la Sección 3.2.2.1. Dicha sección obliga a la agencia a exponer por escrito y hacer formar parte del expediente del Proyecto las razones para no solicitar ciertas pólizas o para solicitar pólizas de diferente naturaleza. El propósito de la cláusula 3.2.2 es darle cierto grado de flexibilidad al gobierno y agencias que construyen obras públicas para atender casos que ameriten que en bienestar de la consecución de la obra o para la protección de los fondos públicos haya que hacer modificaciones en las pólizas requeridas o en la naturaleza de las mismas. La flexibilidad que provee esta sección es necesaria toda vez que los proyectos de construcción de obra pública varían en complejidad y naturaleza. A pesar de que en general las pólizas requeridas son las mencionadas en la cláusula 3.2.1 existen Proyectos que por su alto riesgo, peligrosidad o tecnicismo pueden requerir una modificación en el tipo de póliza. También existen Proyectos de Obra Pública tan sencillos que solicitar todas las pólizas nombradas en la cláusula 3.2.1

resultaría innecesario y oneroso para el contratista lo cual haría la obra más costosa para el gobierno o la agencia. La construcción de obra pública requiere la flexibilidad de pólizas que se ajusten a la obra que se construye. El Reglamento pretende que no se haga más costosa una obra sencilla o que se que al descubierto una obra altamente compleja solo por la rigurosidad de una clausula. En fin el propósito es proteger y asegurar los fondos públicos y lograr la construcción de obras de manera rápida y eficaz pero segura. No empece lo anterior, el propio reglamento limita la flexibilidad de la agencia al tomar esta determinación requiriéndole que si se modifican las pólizas solicitadas en la seccion3.2.1.1 para eximir o aumentar de alguna póliza la agencia presente su justificación por escrito y haga que la misma obre en el expediente.

La segunda recomendación del Procurador de Pequeños Negocios se refiere al grado de control que la agencia o entidad gubernamental contratante tiene sobre la elección de los suplidores, materialistas y/o subcontratistas que se contrataran para el Proyecto. Para atender esta recomendación revisamos las disposiciones de la sección 6.21 del Reglamento y sus subincisos. De la sección antes mencionada surge que el Contratista general del Proyecto u Obra es quien determina cuales serán los subcontratistas, suplidores y materialistas que trabajaran en la Obra. En esa determinación inicial de quienes serán los que trabajaran la agencia no tiene ninguna intervención. Una vez el contratista principal hace su selección, entonces el Reglamento le requiere notificarle a la Agencia un listado de los subcontratistas y suplidores principales que el contratista ha escogido para las porciones principales del Proyecto. Nótese que solo se requieren los subcontratistas y suplidores principales de porciones principales del Proyecto o sea que el contratista no tiene que notificar a la agencia todos los subcontratistas sino solo los principales. La agencia hará una investigación y de tener una objeción justificada y razonable a los suplidores o subcontratistas principales que se le notificaron, entonces, lo expresará por escrito y ese subcontratista no podrá ser contratado para la Obra. Entre las razones que la agencia puede levantar para objetar la contratación de un subcontratista o suplidor se encuentra: (1) que el subcontratista haya incurrido en incumplimientos previos con la agencia; (2) que haya tenido record de violaciones de seguridad; o (3) que tenga historial de desempeño deficiente en sus funciones. Las razones que la agencia exprese para objetar tienen que ser razonables no pueden ser arbitrarias, injustas o ilegales. Esta clausula va dirigida a velar porque se logre la construcción rápida y eficiente de obras y sin exponer a la agencia o gobierno a riesgos innecesarios por subcontratistas riesgosos e ineficientes. Las objeciones de la agencia deberán estar fundamentadas en una investigación y constar por escrito y formar parte del expediente de modo que los derechos de un subcontratista o suplidor que quiera impugnar esta decisión pueda llevar la acción que en derecho estime. Por tanto, de lo anterior surge que la agencia no escoge los subcontratistas o materialistas de un Proyecto sino que si luego de una investigación surge que alguno de los que el contratista general pretende utilizar tiene un historial que puede afectar la obra, la agencia puede rechazarlo por el bienestar de la obra y la protección de los fondos.

VII. CONCLUSION

Luego de este análisis, se puede concluir que el reglamento de las Condiciones Generales Uniformes no tendrá un impacto económico adverso en los pequeños negocios que contraten con las diferentes agencias gubernamentales o corporaciones públicas para la construcción de obras públicas.

GOBIERNO DE PUERTO RICO
JUNTA DE PLANIFICACION
SAN JUAN, PUERTO RICO

26 de junio de 2020

Resolución Núm. JPE-2020-072

EXIMIENDO AL DEPARTAMENTO DE RECREACIÓN Y DEPORTES DEL TRÁMITE ORDINARIO DE PERMISOS ANTE LA OFICINA DE GERENCIA DE PERMISOS Y LOS MUNICIPIOS AUTÓNOMOS CON JERARQUÍA DE LA I A LA V PARA LAS OBRAS DE REPARACIÓN O MEJORAS DE LAS INSTALACIONES DEPORTIVAS Y RECREATIVAS AFECTADAS POR EL HURACÁN MARÍA

La Agencia Federal de Manejo de Emergencias (FEMA, por sus siglas en inglés) y la Oficina de Recuperación y Reconstrucción del Gobierno de Puerto Rico (COR3) el 31 de marzo de 2020 anunciaron la obligación de \$48 millones para la reconstrucción y rehabilitación de 191 instalaciones deportivas del Departamento de Recreación y Deportes (DRD) alrededor de toda la isla, bajo el programa de mejoras permanentes de FEMA. El DRD, mediante comunicación de 1 de abril de 2020, solicita a la Junta de Planificación que se le exima del trámite ordinario para la reparación de instalaciones deportivas.

Este proyecto inicial (FEMA #87524-MDSR026-NCR-DRD, Damage #2755), que incluye 191 instalaciones deportivas y recreativas, consiste en la realización de mejoras que, aunque voluminosas por la cantidad de inmuebles impactados, en materia de la labor a realizar, son relativamente sencillas. Las reparaciones consisten en montaje o reparación de luminarias, instalación de techos de metal anclado, pintura, reparación de graderías ("bleachers"), verjas de perímetro, tableros, instalación o reparación de ventanas y puertas, instalación de techos acústicos, reparación o instalación de receptáculos, paredes de metal, instalación o reparación de equipo recreativo o de juego, tales como columpios, chorreras, sube y bajas, entre otros; demolición y acarreo de material. Se incluye con como anejo de esta resolución el *Damage Description and Dimention* (DDD) de cada una de las instalaciones incluidas en esta etapa inicial y el cual incluye cada una de las reparaciones o mejoras a ser realizadas.

A esos fines, se requiere de los organismos gubernamentales pertinentes, entre los cuales se encuentra la Junta de Planificación, otorguen las exenciones necesarias establecidas en sus leyes y reglamentos para atender situaciones de emergencia con el propósito de agilizar todos los procesos administrativos en el trámite de solicitudes de permisos.

El Artículo 21 de la Ley Núm. 75 de 24 de junio de 1975, supra, autoriza a la Junta de Planificación a adoptar las normas necesarias para determinar qué tipo de obras públicas no tendrán que ser sometidas ante su consideración. Asimismo, la Ley 161-2009, según enmendada, conocida como Ley para la Reforma del Proceso de Permisos de Puerto Rico, establece que será la Junta de Planificación la encargada de establecer y uniformar los distritos de calificación, así como los parámetros para la construcción y uso de los suelos y estructuras en la Isla. También, la Ley 161-2009, ante, dispone que será la Junta de Planificación la responsable, en colaboración con varias otras agencias, de promulgar el *Reglamento Conjunto para la Evaluación y Expedición de Permisos Relacionados al Desarrollo, Uso de Terrenos y Operación de Negocios* ("Reglamento Conjunto").

La Ley 81-1991, según enmendada, conocida como Ley de Municipios Autónomos dispone en su Artículo 13.008 que el Reglamento Conjunto regirá todos los asuntos y aspectos procesales relacionados a la evaluación y adjudicación de una solicitud de permisos por parte de un Municipio Autónomo con Jerarquía de la I a la V.

Tomando en consideración lo anteriormente expuesto, esta Junta de Planificación, conforme a las facultades que le fueran concedidas por la Ley Núm. 75 de 24 de junio de 1975, la Ley 81-1991 y la Ley 161-2009, según enmendadas, **ACUERDA EXIMIR** de cumplir con el trámite ordinario de permisos de la Oficina de Gerencia de Permisos (OGPe) del Departamento de Desarrollo Económico y Comercio o de los Municipios Autónomos con Jerarquía de la I a la V, a toda obra realizada o promovida por el DRD a los fines de simplificar y acelerar el trámite para las mejoras de las instalaciones deportivas y recreativas incluidas en el *Damage Description and Dimention* (DDD) de etapa inicial, el cual incluye cada una de las reparaciones o mejoras a ser realizadas, siempre y cuando se cumplan con las siguientes condiciones:

Mejoras relacionadas a instalaciones deportivas

1. Relocalización de divisiones interiores que no representen alteraciones de aquellas partes del edificio que soportan cargas.
2. Remoción de material deteriorado y sustitución por material de la misma clase, similar o diferente siempre que no requiera cambios de aquellas partes principales del edificio que soportan cargas
3. Instalación de nuevas o reposición de piezas sanitarias.
4. Pintura
5. Renovación sistema eléctrico.
6. Sustitución de ventanas y puertas.
7. Colocación de losetas en pisos o azulejos y cerámica en baños y cocinas.
8. Corrección de grietas en hormigón o empañetado de paredes.
9. Renovación de los sistemas de distribución de agua potable y disposición de aguas negras.
10. Instalación de equipos, tales como acondicionadores de aire, extractores, altoparlantes y sistema de intercomunicación, entre otros.
11. Cambios en fachadas que no representen cambios en aquellas partes del edificio que soportan cargas y cuando este no radique en zona histórica.
12. Asfaltar o proveer capa de hormigón asfáltico, afirmado de caminos sobre rodaje manteniendo su ancho existente, reparación de encintados y cunetas deterioradas, así como bacheo, corrección o relleno de hoyos u otros desperfectos del pavimento.
13. Construcción y reconstrucción de calles, aceras, senderos y otras vías utilizando servidumbre o vías públicas existentes.
14. Sustitución o renovación sistema alumbrado público.
15. Mejoras en pocetos y parrillas en sistemas pluviales que no alteren diseño o aumenten capacidad del sistema.
16. Construcción de verjas en conformidad con reglamentos vigentes en cuanto altura.
17. Instalación de plumas públicas autorizadas por Departamento de Salud y la Autoridad de Acueductos y Alcantarillados.
18. Instalación de tubos para desagüe pluviales en caminos vecinales no incluidos en Plano Regulador de Carreteras.
19. Limpieza de zanjas en carreteras o caminos.
20. Extensión líneas alumbrado público a poblados existentes.
21. Construcción de instalaciones deportivas no marítimas o acuáticas que no requieren edificación de clase alguna cuando se posea el terreno y se cuente con consulta de ubicación aprobada por la Junta Adjudicativa de la OGPe.

Las obras de reparación o mejoras podrán efectuarse sin la necesidad de solicitar un permiso de construcción, siempre y cuando las mejoras y las instalaciones estén contempladas en el *Damage Description and Dimention* (DDD), el cual incluye cada una de las reparaciones o mejoras a ser realizadas.

Previo a ejecutar cualquier obra de reparación o mejora se deberá cumplir con las siguientes condiciones:

1. Para toda obra de reparación o mejora deberá contar con una certificación de un ingeniero o arquitecto licenciado que acredite que las labores a realizarse no comprometen o menoscaban la integridad de la estructura a repararse ni la seguridad de los ciudadanos quienes en ésta habitan.
2. De requerirse algún tipo de reparación relacionada a los servicios básicos de agua y electricidad, las mismas deberán estar certificadas por los peritos correspondientes.
3. Queda expresamente prohibido mediante este procedimiento el aumento o cambio de la huella, o dimensiones de la estructura objeto de reparación o mejora. Cualquier cambio se mantendrá dentro de las condiciones existentes.
4. Toda obra exenta de permiso de construcción deberá cumplir con la notificación a la OGPe o el Municipio Autónomo con Jerarquía de la I a la V, pago de la póliza del Fondo del Seguro del Estado, los arbitrios de construcción y patente municipal.
5. Será deber del DRD lo siguiente:
 - a. Supervisar el cumplimiento e implementación de estas disposiciones.

- b. Someter un informe anual a la Junta de Planificación al término de culminación de esta resolución. Dicho informe deberá de incluir el número de caso del *Single Business Portal* (SBP), el número de catastro, nombre del municipio y coordenadas. El informe debe de estar en un formato de Excel o en un sistema compatible con un sistema de información geográfica.
- c. Se le apercibe que deberá cumplir con la Ley 416-2004, según enmendada, conocida como "*Ley sobre Política Pública Ambiental*".

Se determina que si alguna de las reparaciones o mejoras de las instalaciones incluidas en el *Damage Description and Dimention* (DDD), implica una mejora pública, por lo que se exige al DRD de presentar la mejora pública ante la Junta Adjudicativa de la OGPe. El Reglamento Conjunto define "*Mejora u Obra Pública*" como toda mejora permanente, toda nueva construcción, ampliación o reconstrucción (sin incluir reparación) de obra pública autorizada, pagada, supervisada, dirigida, emprendida o controlada por cualquier organismo gubernamental, incluyendo, entre otras, toda adquisición, venta, permuta, cesión, arrendamiento o cambio en el uso de propiedades por cualquier funcionario y organismo y las llevadas a cabo mediante contratos de obra con entidades privadas.

Esta resolución será de aplicación exclusiva para los proyectos de mejoras en instalaciones afectadas por el Huracán María, que forman parte del *Damage Description and Dimention* (DDD) con fecha de 28 de enero de 2020, Project # 87524 4339DR-PR (4339DR). Además, el procedimiento aquí establecido no exige de cumplir con la reglamentación Federal aplicable bajo los fondos 4339DR-PR.

Notifíquese copia fiel y exacta de esta Resolución a la OGPe y a los Municipios Autónomos con Jerarquía de la I a la V. Además, se dispone que copia de la presente Resolución sea colocada en el portal de la Junta de Planificación de Puerto Rico (<http://jp.pr.gov>).

ADOPTADA en San Juan, Puerto Rico hoy, 26 de junio de 2020

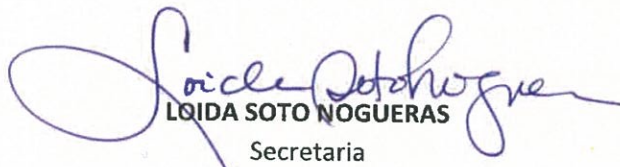

MARIA DEL C. GORDILLO PÉREZ
Presidenta


SUHEYDY BARRETO SOTO
Miembro Asociado


REBECCA RIVERA TORRES
Miembro Asociado

CERTIFICO: Que la anterior es copia fiel y exacta de la Resolución adoptada por la Junta de Planificación de Puerto Rico en su reunión celebrada el 26 de junio de 2020 y para que así conste, firmo la presente.

En San Juan, Puerto Rico hoy **30 JUN 2020**


LOIDA SOTO NOGUERAS
Secretaria

