

1 Make the following section a part of the Standard Specifications:

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3 **"SECTION 651 – ELECTRICAL UTILITY SYSTEM**

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5 **651.01 Description.** This work includes constructing electric underground
6 structures and facilities, and ductlines required for the relocation of Kauai Island
7 Utility Cooperative (KIUC) facilities according to the contract or as specified by
8 the Engineer. KIUC will furnish, install, connect and test all proposed overhead
9 and underground wire and cable as may be required, including guy wires. KIUC
10 will also remove and/or install utility poles and anchors.

11
12 **651.02 Materials.** Furnish all materials for the manholes, handholes and
13 ductlines unless otherwise indicated. Materials shall conform to the following:

14

15 Structural Concrete	601
16 Reinforcing Steel	602
17 Structure Backfill Material	703.20
18 Trench Backfill Material	703.21
19 Conduits	712.27

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25 Concrete shall conform to Section 601 - Structural Concrete. The
26 maximum size of coarse aggregates shall be three-quarter inch in lieu of the one
27 inch to No. 4 specified. Concrete duct banks shall be Class A concrete.

28
29 Underground conduit and fittings shall be rigid polyvinylchloride (PVC),
30 Schedule 40. Conduit risers shall be zinc-coated rigid steel. Schedule 40 rigid
31 PVC conduit shall be extruded standard wall electrical conduit and each length
32 shall bear the label of Underwriter's Laboratory, Inc. Adhere to the requirements
33 of U.S. Department of Commerce, Commercial Standard CS207-60.

34
35 Pulling irons, fittings and miscellaneous hardware shall be according to
36 KIUC standard details.

37
38 **651.03 Construction Requirements.**

39
40 **(A) General.** Avoid disturbing existing facilities. Remove and dispose
41 of all demolished or excess material from the job site.

42
43 Notify KIUC's Construction Coordinator/Inspector at least 3 working
44 days in advance of intent to commence concreting operations for duct
45 lines.

Construction of KIUC's underground facilities shall be in accordance with KIUC standards and requirements. Refer to the plans for additional requirements relating to KIUC facilities.

(B) Existing Utilities. Existing KIUC facilities shown on the plans are approximate locations. Utility facilities to be constructed are shown on the plans in approximate locations for the convenience of the Contractor.

It shall be the Contractor's responsibility to ascertain the location of all existing utilities which may be subject to damage by reason of its operations. The Contractor shall be responsible for and shall pay for all damages to existing utilities of all types.

The Contractor shall:

(1) Support and/or protect as required all facilities during construction,

(2) Notify the Engineer immediately of any damage to any facility caused by construction under this Contract, and

(3) Reconstruct damaged portions of any utility system according to the contract and as specified by the Engineer at no cost to the State.

(C) KIUC Facilities. Provide KIUC with 24-hour access to all existing KIUC facilities that are to remain, or until they are removed, and to all new KIUC facilities after they are installed. The Contractor shall be responsible for any delays in company work due to its failure to provide access to company facilities. All existing KIUC facilities shall remain in place until after completing and energizing the proposed permanent and/or temporary facilities, unless otherwise noted on the plans. Any cost of temporary relocations arising during construction for the Contractor's benefit shall be at no cost to the State and KIUC.

Electrical equipment or conductors, whether electrically energized or not, shall remain in place at all times during construction unless otherwise indicated. KIUC shall perform the handling and moving of electrical equipment or conductors, when required by the Engineer. Work by the Contractor in areas with energized electrical equipment or conductors shall be performed with extreme caution to prevent accidents and to avoid disturbing or damaging the equipment or conductors or any temporary supports or protective guards that are constructed. Unless otherwise permitted by KIUC, all work by the Contractor in areas with energized equipment or conductors shall be performed in the presence of a company inspector and/or standby man. The Contractor shall have the

92 sole responsibility for maintaining safe and efficient working conditions
93 and procedures in these areas.

94 KIUC shall replace any existing or new company facilities, including
95 equipment or conductors damaged by the Contractor during construction,
96 at the Contractor's expense.

97
98 The Contractor shall give KIUC 60 calendar days advance notice
99 for any work to be done by KIUC on its facilities. Failure for KIUC to meet
100 the Contractor's schedule shall not be considered a State delay. It shall
101 be considered as a delay beyond the contractor's control and be remedied
102 in the manner specified in subsection 108.05(B)(3) Delays Beyond the
103 Contractor's Control, provided the required notification was given. If
104 required notification was not given, it shall be considered a contractor's
105 delay. Unless otherwise indicated on the plans or otherwise directed by
106 the Engineer, KIUC, will:

107
108 (1) Remove the concrete envelope from existing underground
109 ducts containing electrical cables.

110
111 (2) Construct temporary supports and protective barriers for
112 bare duct and electrical cables immediately after removal of the
113 concrete envelope is completed.

114
115 (3) Remove temporary supports and protective barriers
116 constructed under (2) above.

117
118 (4) Remove existing joint utility poles and anchors and install
119 new joint utility poles and anchors.

120
121 **(D) Excavation and Backfill.** All excavation and backfill for electric
122 underground structures and trenches shall conform to Section 204 –
123 Excavation and Backfill for Miscellaneous Facilities, modified as follows:

124
125 **(1) Excavation.**

126
127 (a) The width of trenches for duct banks shall not be less
128 than the width of the encasement nor more than that
129 required to properly and safely execute the work.

130
131 (b) Excavate the trenches at least 40 feet ahead of duct
132 placement so that any obstruction to the duct line can be
133 avoided through gradual alignment. The Engineer may
134 adjust the profile grade to increase or decrease the
135 excavation depth (up to 3 feet) as a result of unforeseen
136 obstruction at no additional cost.

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(c) Excavation for each handhole, plus 50 feet of trenching for all ducts connected to these structures shall be complete before starting construction on these structures. Backfill all cuts in excess of depths required with compacted bed course material at no cost to the State and KIUC.

(d) All excavation shall be inspected by the Engineer and KIUC before placing any ducts or conduits or before constructing any structures and foundations.

(e) Widen the trenches at handholes and manholes to permit proper entry of the ducts and conduits.

(f) Do not excavate for handholes, manholes, and ductlines until after staking out and verifying the locations for these structures correctly by KIUC through the Engineer.

(2) Backfill. Do not place backfill until after verifying the duct and conduit installations by KIUC through the Engineer.

Trench backfill material placed below a horizontal plane 12 inches above the top of the duct bank shall conform to Subsection 703.21 (A) – Trench Backfill Material A.

Backfill the remainder of the trench with structure backfill material according to Section 703.20 with structure backfill material B or with trench backfill material according to Subsection 703.21(B) – Trench Backfill Material B.

(E) Construction of Handholes and Manholes. KIUC inspectors will verify and approve the locations and depths of handholes and manholes before construction or installation. Do not place concrete for handholes and manholes until after the KIUC inspector inspects the work and the concrete specifications have been approved by the Engineer. Clean and keep all completed facilities free of loose concrete, lumber, debris and other extraneous matter.

(F) Installation of Ducts Encased in Concrete Jacket. Install all plastic ducts installed in trench for KIUC with concrete jacket or cover unless otherwise indicated. All joints shall be watertight.

182 **(1) Plastic Conduit (PVC).**
183

184 **(a)** Refer to KIUC's Service Installation Manual for
185 installation details and for dimensions of plastic conduit
186 accessories installed in trench.

187
188 **(b)** The accessories shall be of the same type material as
189 the conduit selected.

190
191 **(2) Plastic Conduit Storage and Transportation.**
192

193 **(a)** Conduits that are to be stored for more than 2 weeks
194 shall be covered.

195
196 **(b)** Provide support for the full length of the conduit when
197 transporting or storing long lengths. The Engineer will not
198 permit unsupported overhang.

199
200 **(c) Plastic Conduit Installation.**
201

202 **(i)** Conduit shall be square cut with a fine tooth
203 wood saw. Remove all burrs.

204
205 **(ii)** Wipe all foreign matter off the sockets of the
206 fittings and the edges of the conduit with a clean
207 cloth.

208
209 **(3) Plastic Conduit Solvent-Cemented Joints.**
210

211 **(a)** The cement for PVC conduits should be obtained
212 from the conduit manufacturer. Use a clean paper paint pot
213 for containing the cement during use. The Engineer will not
214 permit adding of thinners to the cement.

215
216 **(b)** Apply a liberal and uniform coat of cement to the
217 conduit for a length equal to the depth of the socket. Also
218 apply sufficient cement to set the socket of the fitting. Avoid
219 excess cement on the fitting as it is wiped into the joint and
220 tends to weaken the pipe. Do not use plastic bristle
221 brushes. The brush size shall be approximately equal to
222 joint depth, for example, a two- inch brush for a four- inch
223 conduit.

224
225 **(c)** Slip the conduit into the socket of the fitting with a
226 slight twist until the conduit bottoms.
227

228 Hold the joint for 15 seconds so the conduit does not
229 push out of the fitting. Do not twist or drive the pipe after
230 the insertion is complete.

231
232 (d) Cure the joined members for at least five minutes
233 before disturbing or applying stress to the joint. After this
234 initial cure, do not twist or pull the joint. In damp weather,
235 increase this interval to allow for slower evaporation of the
236 solvent. Assemble all conduits above ground and allow the
237 conduit to lie undisturbed while curing before lowering it into
238 the trench or installing on bridges.

239
240 (e) Wipe off excess cement left on the outer shoulder of
241 the fitting.

242
243 (f) Another fitting or section of conduit may be added to
244 the opposite end within two or three minutes if care is
245 exercised in handling so that strain is not placed on the
246 previous assembly.

247
248 (g) Return the brush to the cement pot after covering the
249 joint surfaces. When stopping work, place the brush in a
250 solvent; pour unused cement back in the can and cover
251 tightly. When re-using the brush, shake out the excess
252 solvent before dipping it into the cement.

253
254 (h) Assemble any joint, included in a section of conduit to
255 be bent, above ground and allow to lie undisturbed for at
256 least two hours before installation in a trench. In cases
257 where a plastic connection is made with the union under
258 stress due to misalignment or other factors, stake out the
259 union to relieve stress on the joint until after backfilling or
260 encasing the conduit.

261
262 (i) Cover all open trenches at the end of each work day
263 to minimize accidental mechanical damage to conduits.

264
265 **(4) Plastic Conduit Temperature.**

266
267 (a) All conduits shall be cool prior to placing in trenches
268 and when the concrete jacket is being poured.

269
270 (b) Due to expansion and contraction of the plastic
271 conduit of 1-1/2 inches per 100 feet for every 20°F change
272 in the temperature, allow extra conduit footage at each tie-in
273 for contraction when the conduit temperature is higher than

that of the earth; or extra room for expansion if the converse condition exists.

(5) Plastic Conduit Spacers.

(a) Place spacers for plastic conduit along the length of the conduit at a maximum spacing of six feet on center.

(b) The terminated ends of the conduit in an underground structure shall be free of support for a distance of at least 10 feet from the structure. Align and support the conduit inside the structure with proper spacing and cut to length after the concrete envelope has cured.

(c) Seal the ends of the conduit with a plastic cap or plug at the end of each day's work, when work on duct installation has to be interrupted, where ducts may be submerged in water, or in stub-outs.

(d) Test, in the presence of KIUC inspectors, the completed ducts provided for KIUC's use by passing a bullet shaped test mandrel about 12 inches long with a diameter 1/2 inch less than the inside diameter of the ducts through the length of each duct run. Scars in the mandrel deeper than 1/32 inch, other than that caused by normal abrasion between the duct line and bottom of mandrel are an indication of the presence of burrs and/or obstructions in the duct run. Remove such burrs and/or obstructions, after which the test mandrel will be passed through again. Repeat the process until approved by the KIUC inspector.

(e) After testing, furnish and install pulling wire or muletape in all ducts, in accordance with KIUC requirements, and plug both ends of each duct with plastic plugs.

(G) Restoration of Existing Streets and Other Improvements.

Restore streets, sidewalks, driveways, walkways, curbs, gutters, walls, fences, buildings and all other improvements inside and outside of the right-of-way, publicly or privately owned, which are damaged by the Contractor's operations to their original condition, or better, at no cost to the State or KIUC. Trenches through roadways shall be repaved over the entire section. Materials and workmanship shall conform to the applicable sections in these specifications.

317 **651.04 Measurement.** The Engineer will measure the KIUC ductline, KIUC
318 manhole, KIUC handhole, KIUC pole riser and KIUC service reconnections for
319 payment.
320

321 **651.05 Payment.** The Engineer will pay for the accepted KIUC ductline at the
322 contract unit price per linear foot complete in place. The price includes full
323 compensation for furnishing and installing the ductline, warning tape, muletape,
324 pullstring, excavation, pouring concrete, backfilling, furnishing and installing
325 conduit, making required handhole penetrations, placing aggregate subbase,
326 asphalt concrete base, asphalt concrete pavement, restoring sidewalks,
327 salvaging existing materials, making required tests and furnishing labor,
328 materials, equipment, tools, and incidentals necessary to complete the work.
329

330 The Engineer will pay for the accepted KIUC handhole at the contract unit
331 price per each complete in place. The price includes full compensation for
332 furnishing and installing the handhole frame and cover, intercepting existing
333 ductlines, restoring appurtenances damaged or destroyed during construction,
334 salvaging existing materials, furnishing labor, materials, equipment, tools, and
335 incidentals necessary to complete the work.
336

337 The Engineer will pay for the accepted KIUC manhole at the contract unit
338 price per each complete in place. The price includes full compensation for
339 furnishing and installing the manhole frame and cover, intercepting existing
340 ductlines, restoring appurtenances damaged or destroyed during construction,
341 salvaging existing materials, furnishing labor, materials, equipment, tools, and
342 incidentals necessary to complete the work.
343

344 The Engineer will pay for the accepted KIUC pole riser at the contract unit
345 price per each complete in place. The price includes full compensation for
346 furnishing and installing the 90-degree conduit bend up to 3 feet above grade,
347 restoring appurtenances damaged or destroyed during construction, salvaging
348 existing materials, furnishing labor, materials, equipment, tools, and incidentals
349 necessary to complete the work.
350

351 The Engineer will pay for the accepted KIUC service reconnections at the
352 contract unit price per each complete in place. The price includes full
353 compensation for furnishing and installing raceways and conductors, required
354 connections, restoring existing building finishes, salvaging existing materials,
355 making required tests and furnishing labor, materials, equipment, tools, and
356 incidentals necessary to complete the work.
357

358 The Engineer will consider additional materials and labor, needed to
359 complete the installation of the system and not shown in the contract as included
360 in the bid price of the various contract items.
361

The Engineer will pay for each of the pay items when included in the proposal schedule:

Pay Item	Pay Unit
KIUC Ductline _____	L.F.
KIUC Handhole _____	Each
KIUC Manhole _____	Each
KIUC Pole Riser _____	Each
KIUC Service Reconnections	Each"

END OF SECTION 651