

1 Amend **Section 101 - TERMS, ABBREVIATIONS, AND DEFINITIONS** to read
2 as follows:

3
4 **“DIVISION 100 - GENERAL PROVISIONS**

5
6 **SECTION 101 - TERMS, ABBREVIATIONS, AND DEFINITIONS**

7
8 **101.01 Meaning of Terms.** The specifications are generally written in the
9 imperative mood. In sentences using the imperative mood, the subject, “the
10 Contractor shall”, is implied. In the material specifications, the subject may also
11 be the supplier, fabricator, or manufacturer supplying material, products, or
12 equipment for use on the project. The word “will” generally pertains to decisions
13 or actions of the State.

14
15 When a publication is specified, it refers to the most recent date of issue,
16 including interim publications, before the bid opening date for the project, unless
17 a specific date or year of issue is provided.

18
19 **101.02 Abbreviations.** Meanings of abbreviations used in the specifications,
20 on the plans, or in other contract documents are as follows:

21		
22	AAN	American Association of Nurserymen
23		
24	AASHTO	American Association of State Highway and
25		Transportation Officials
26		
27	ACI	American Concrete Institute
28		
29	ADA	Americans with Disabilities Act
30		
31	ADAAG	Americans with Disabilities Act Accessibility Guidelines
32		
33	AGC	Associated General Contractors of America
34		
35	AIA	American Institute of Architects
36		
37	AISC	American Institute of Steel Construction
38		
39	AISI	American Iron and Steel Institute
40		
41	ANSI	American National Standards Institute
42		
43	APA	American Plywood Association
44		
45	ARA	American Railway Association
46		

47	AREA	American Railway Engineering Association
48		
49	ASA	American Standards Association
50		
51	ASCE	American Society of Civil Engineers
52		
53	ASLA	American Society of Landscape Architects
54		
55	ASTM	American Society for Testing and Materials
56		
57	AWG	American Wire Gauge
58		
59	AWPA	American Wood Preserver's Association
60		
61	AWS	American Welding Society
62		
63	AWWA	American Water Works Association
64		
65	BMP	Best Management Practice
66		
67	CCO	Contract Change Order
68		
69	CFR	Code of Federal Regulations
70		
71	CRSI	Concrete Reinforcing Steel Institute
72		
73	DCAB	Disability and Communication Access Board, Department of Health, State of Hawaii
74		
75		
76	DOTAX	Department of Taxation, State of Hawaii
77		
78	EPA	U.S. Environmental Protection Agency
79		
80	FHWA	Federal Highway Administration, U.S. Department of Transportation
81		
82		
83	FSS	Federal Specifications and Standards, General Services Administration, U.S. Department of Defense
84		
85		
86		
87	HAR	Hawaii Administrative Rules
88		
89	HDOT	Department of Transportation, State of Hawaii
90		
91	HIOSH	Occupational Safety and Health, Department of Labor and Industrial Relations, State of Hawaii
92		
93		

94	HMA	Hot Mix Asphalt
95		
96	HRS	Hawaii Revised Statutes
97		
98	ICEA	Insulated Cable Engineers Association (formerly IPCEA)
99		
100	IMSA	International Municipal Signal Association
101		
102	IRS	Internal Revenue Service
103		
104	ITE	Institute of Transportation Engineers
105		
106	MUTCD	Manual on Uniform Traffic Control Devices for Streets and Highways, FHWA, U.S. Department of Transportation
107		
108		
109	NCHRP	National Cooperative Highway Research Program
110		
111	NEC	National Electric Code
112		
113	NEMA	National Electrical Manufacturers Association
114		
115	NFPA	National Forest Products Association
116		
117	NPDES	National Pollutant Discharge Elimination System
118		
119	OSHA	Occupational Safety and Health Administration/Act, U.S. Department of Labor
120		
121		
122	SAE	Society of Automotive Engineers
123		
124	SI	International Systems of Units
125		
126	UFAS	Uniform Federal Accessibility Standards
127		
128	UL	Underwriter's Laboratory
129		
130	USGS	U.S. Geological Survey
131		
132	VECP	Value Engineering Cost Proposal
133		

134 **101.03 Definitions.** Whenever the following words, terms, or pronouns are
 135 used in the contract documents, unless otherwise prescribed therein and without
 136 regards to the use or omission of uppercase letters, the intent and meaning shall
 137 be interpreted as follows:

138
 139 **Addendum (plural - Addenda)** - A written or graphic document, including
 140 drawings and specifications, issued by the Director during the bidding period.

141 This document modifies or interprets the bidding documents by additions,
142 deletions, clarifications or corrections.

143

144 **Addition** (to the contract sum) - Amount added to the contract sum by change
145 order.

146

147 **Advertisement** - A public announcement inviting bids for work to be performed or
148 materials to be furnished.

149

150 **Amendment** - A written document issued to amend the existing contract between
151 the State and Contractor and properly executed by the Contractor and Director.

152

153 **Award** - Written notification to the bidder that the bidder has been awarded a
154 contract.

155

156 **Bad Weather Day (or Unworkable Day)** - A day when weather or other conditions
157 prevent a minimum of four hours of work with the Contractor's normal work force
158 on critical path activities at the site.

159

160 **Bag** - 94 pounds of cement.

161

162 **Barrel** - 376 pounds of cement.

163

164 **Base Course** - The layer or layers of specified material or selected material of a
165 designed thickness placed on a subbase or subgrade to support a surface course.

166

167 **Basement Material** - The material in excavation or embankments underlying the
168 lowest layer of subbase, base, pavement, surfacing or other specified layer.

169

170 **Bid** - See Proposal.

171

172 **Bidder** - An individual, partnership, corporation, joint venture or other legal entity
173 submitting, directly or through a duly authorized representative or agent, a
174 proposal for the work or construction contemplated.

175

176 **Bidding Documents (or Solicitation Documents)** - The published solicitation
177 notice, bid requirements, bid forms and the proposed contract documents
178 including all addenda and clarifications issued prior to receipt of the bid.

179

180 **Bid Security** - The security furnished by the bidder from which the State may
181 recover its damages in the event the bidder breaches its promise to enter into a
182 contract with the State, or fails to execute the required bonds covering the work
183 contemplated, if its proposal is accepted.

184

185 **Blue Book** - EquipmentWatch Cost Recovery (formerly known as
186 EquipmentWatch Rental Rate Blue Book), available from EquipmentWatch, a
187 division of Penton, Inc.

188

189 **Calendar Day** - See Day.

190

191 **Change Order (or Contract Change Order)** - A written order signed by the
192 Engineer issued with or without the consent of the Contractor directing changes in
193 the work, contract time or contract price. The purposes of a change order
194 include, but are not limited to (1) establishing a price or time adjustment for
195 changes in the work; (2) establishing full payment for direct, indirect, and
196 consequential costs, including costs of delay; (3) establishing price adjustment
197 or time adjustment for work covered and affected by one or more field orders; or
198 (4) settling Contractor's claims for direct, indirect, and consequential costs, or
199 for additional contract time, in whole or in part.

200

201 **Completion** - See Substantial Completion and Final Completion.

202

203 **Completion Date** - The date specified by the contract for the completion of all
204 work on the project or of a designated portion of the project.

205

206 **Comptroller** - the Comptroller of the State of Hawaii, Department of Accounting
207 and General Services.

208

209 **Contract** - The written agreement between the Contractor and the State, by -
210 which the Contractor shall provide all labor, equipment, and materials and perform
211 the specified work within the contract time stipulated, and by which the State of
212 Hawaii is obligated to compensate the Contractor at the prices set forth in the
213 contract documents.

214

215 **Contract Certification Date** - The Date on which the Deputy Comptroller for the
216 State of Hawaii (or authorized representative) signs the Contract Certification.

217

218 **Contract Completion Date** - The calendar day on which all work on the project,
219 required by the contract, must be completed. See CONTRACT TIME.

220

221 **Contract Documents** - The contract, solicitation, addenda, notice to bidders,
222 Contractor's bid proposal (including wage schedule, list of subcontractors and
223 other documentations accompanying the bid), notice to proceed, bonds, general
224 provisions, special provisions, specifications, drawings, all modifications, all
225 written amendments, change orders, field orders, orders for minor changes in the
226 work, the Engineer's written interpretations and clarifications issued on or after the
227 effective date of the contract.

228

229 **Contract Item (Pay Item)** - A specific unit of work for which there is a price in the
230 contract.

231

232 **Contract Modification (Modification)** - A change order that is mutually agreed to
233 and signed by the parties to the contract.

234

235 **Contract Price** - The amount designated on the face of the contract for the
236 performance of work.

237
238 **Contract Time (or Contract Duration)** - The number of calendar or working days
239 provided for completion of the contract, inclusive of authorized time extensions.
240 Contract time shall commence on the Start Work Date and end on the Substantial
241 Completion Date. If in lieu of providing a number of calendar or working days, the
242 contract requires completion by a certain date, the work shall be completed by that
243 date.

244
245 **Contracting Officer** - See Engineer.

246
247 **Contractor** - Any individual, partnership, firm, corporation, joint venture, or
248 other legal entity undertaking the execution of the work under the terms of the
249 contract with the State.

250
251 **Critical Path** - Longest logical sequence of activities that must be completed on
252 schedule for the entire project to be completed on schedule.

253
254 **Day** - Any day shown on the calendar, beginning at midnight and proceeding up
255 to, but not including, midnight the following day. If no designation of calendar or
256 working day is made, "day" shall mean calendar day.

257
258 **Department** - The Department of Transportation of the State of Hawaii
259 (abbreviated HDOT).

260
261 **Director** - The Director of the HDOT acting directly or through duly authorized
262 representatives.

263
264 **Plans (or Drawings)** - The contract drawings in graphic or pictorial form including
265 the notes, tables and other notations thereon indicating the design, location,
266 character, dimensions, and details of the work.

267
268 **Engineer** - The Highway Administrator, Highways Division, HDOT, or the
269 authorized person delegated to act on the Administrator's behalf.

270
271 **Equipment** - All machinery, tools, and apparatus needed to complete the
272 contract.

273
274 **Field Order** - A written order issued by the Engineer or the Engineer's authorized
275 representative to the Contractor requiring a change or changes to the contract
276 work. A field order may (1) establish a price adjustment or time adjustment; or
277 (2) may declare that no adjustment will be made to contract price or contract time;
278 or (3) may request the Contractor to submit a proposal for an adjustment to the
279 contract price or contract time.

280

281 **Final Acceptance** - The Status of the project when the Engineer finds that the
282 Contractor has satisfactorily completed all contract work in compliance with the
283 contract including all plant establishment requirements, and all the materials have
284 been accepted by the State.

285
286 **Final Completion** - The date set by the Director that all work required by the
287 contract has been completed in full compliance with the contract documents.

288
289 **Final Inspection** - Inspection where all contract items (with the exception of
290 Planting Period and Plant Establishment Period) are accepted by the Engineer.
291 Substantial Completion will be issued by the Engineer based on the satisfactory
292 results of the Final Inspection.

293
294 **Float** - The amount of time between when an activity can start and when an activity
295 must start, i.e., the time available to complete non-critical activities required for
296 the performance of the work without affecting the critical path.

297
298 **Guarantee** - Legally enforceable assurance of the duration of satisfactory
299 performance of quality of a product or work.

300
301 **Hawaii Administrative Rules** - Rules adopted by the State in accordance with
302 Chapter 91 of the Hawaii Revised Statutes, as amended.

303
304 **Highway (Street, Road, or Roadway)** - A public way within a right-of-way
305 designed, intended, and set aside for use by vehicles, bicyclists, or pedestrians.

306
307 **Highways Division** - The Highways Division of the Hawaii Department of
308 Transportation constituted under the laws of Hawaii for the administration of
309 highway work.

310
311 **Holidays** - The days of each year which are set apart and established as State
312 holidays pursuant to Chapter 8 of the Hawaii Revised Statutes, as amended.

313
314 **Inspector** - The Engineer's authorized representative assigned to make detailed
315 inspections of contract performance, prescribed work, and materials supplied.

316
317 **Laboratory** - The testing laboratory of the Highways Division or other testing
318 laboratories that may be designated by the Engineer.

319
320 **Laws** - All Federal, State, and local laws, executive orders and regulations having
321 the force of law.

322
323 **Leveling Course** - An aggregate mixture course of variable thickness used to
324 restore horizontal and vertical uniformity to existing pavements or shoulders.

325
326 **Liquidated Damages** - The amount prescribed in Subsection 108.08 - Liquidated
327 Damages for Failure to Complete the Work or Portions of the Work on Time, to be

328 paid to the State or to be deducted from any payments payable to or, which may
329 become payable to the Contractor.

330
331 **Lump Sum (LS)** - When used as a payment method means complete payment
332 for the item of work described in the contract documents.

333
334 **Material** - Any natural or manmade substance or item specified in the contract to
335 be incorporated in the work.

336
337 **Notice to Bidders** - The advertisement for proposals for all work or materials on
338 which bids are required. Such advertisement will indicate the location of the work
339 to be done or the character of the material to be furnished and the time and place
340 for the opening of proposals.

341
342 **Notice to Proceed** - Written notice from the Engineer to the Contractor identifying
343 the date on which the Contractor is to begin procuring materials and required
344 permits and adjusting work forces, equipment, schedules, etc. prior to beginning
345 physical work.

346
347 **Pavement** - The uppermost layer of material placed on the traveled way or
348 shoulders or both. Pavement and surfacing may be interchangeable.

349
350 **Pavement Structure** - The combination of subbase, base, pavement, surfacing
351 or other specified layer of a roadway constructed on a subgrade to support the
352 traffic load.

353
354 **Payment Bond** - The security executed by the Contractor and surety or sureties
355 furnished to the Department to guarantee payment by the Contractor to laborers,
356 material suppliers and subcontractors in accordance with the terms of the contract.

357
358 **Physical Work** - Physical construction activities on the project site or at
359 appurtenant facilities including staging areas. It includes (i) building or installing
360 any structures or facilities including, but not limited to sign erection; BMP
361 installation; field office site grading and building; (ii) removal, adjustment, or
362 demolition of physical obstructions on site; (iii) any ground breaking activities; and
363 (iv) any utility work. It does not include pre-construction environmental testing
364 (such as water quality baseline measurements) that may be required as part of
365 contract.

366
367 **Pre-Final Inspection** - Inspection scheduled when Contractor notifies Engineer
368 that all physical work on the project, with the exception of planting period and plant
369 establishment period, has been completed. Notice from Contractor of substantial
370 completion will suspend contract time until Contractor receives punchlist from
371 Engineer.

372
373 **Profile Grade** - The elevation or gradient of a vertical plane intersecting the top
374 surface of the proposed pavement.

375

376 **Project Acceptance Date** - The calendar day on which the Engineer accepts the
377 project as completed. See Final Completion.

378

379 **Proposal (Bid)** - The executed document submitted by a Bidder in response to a
380 solicitation request, to perform the work required by the proposed contract
381 documents, for the price quoted and within the time allotted.

382

383 **Public Traffic** - Vehicular or pedestrian movement on a public way.

384

385 **Punchlist** - A list compiled by the Engineer specifying work yet to be completed or
386 corrected by the Contractor in order to substantially complete the contract.

387

388 **Questionnaire** - The specified forms on which the bidder shall furnish required
389 information as to its ability to perform and finance the work.

390

391 **Request for Change Proposal** - A written notice from the Engineer to the
392 Contractor requesting that the Contractor provide a price and/or time proposal for
393 contemplated changes preparatory to the issuance of a field order or change order.

394

395 **Right-of-Way** - Land, property, or property interests acquired by a government
396 agency for, or devoted to transportation purposes.

397

398 **Roadbed** - The graded portion of a highway within top and side slopes, prepared
399 as a foundation for the pavement structure and shoulders.

400

401 **Roadside** - The area between the outside edges of the shoulders and the right-of-
402 way boundaries. Unpaved median areas between inside shoulders of divided
403 highways and infield areas of interchanges are included.

404

405 **Section and Subsection** - Section or subsection shall be understood to refer to
406 these specifications unless otherwise specified.

407

408 **Shop Drawings** - All drawings, diagrams, illustrations, schedules and other data
409 or information which are specifically prepared or assembled by or for the
410 Contractor and submitted by the Contractor to illustrate some portion of the work.

411

412 **Shoulder** - The portion of the roadway next to the traveled way for:
413 accommodation of stopped vehicles, placement of underground facilities,
414 emergency use, and lateral support of base and surface courses.

415

416 **Sidewalk** - That portion of the roadway primarily constructed for use by
417 pedestrians.

418

419 **Solicitation** - An invitation to bid or request for proposals or any other document
420 issued by the Department to solicit bids or offers to perform a contract. The

421 solicitation may indicate the time and place to receive the bids or offers and the
422 location, nature and character of the work, construction or materials to be provided.

423

424 **Specifications** - Compilation of provisions and requirements to perform
425 prescribed work.

426

427 **(A) Standard Specifications.** Specifications by the State intended for
428 general application and repetitive use.

429

430 **(B) Special Provisions.** Revisions and additions to the standard
431 specifications applicable to an individual project.

432

433 **Standard Plans** - Drawings provided by the State for specific items of work
434 approved for repetitive use.

435

436 **State** - The State of Hawaii, its Departments and agencies, acting through its
437 authorized representative(s).

438

439 **State Waters** – All waters, fresh, brackish, or salt, around and within the State,
440 including, but not limited to, coastal waters, streams, rivers, drainage ditches,
441 ponds, reservoirs, canals, ground waters, and lakes; provided that drainage
442 ditches, ponds, and reservoirs required as a part of a water pollution control
443 system are excluded.

444

445 **Start Work Date** - Date on which Contractor begins physical work on the contract.
446 This date shall also be the beginning of Contract Time.

447

448 **Structures** - Bridges, culverts, catch basins, drop inlets, retaining walls,
449 cribbing, manholes, endwalls, buildings, sewers, service pipes, underdrains,
450 foundation drains, and other such features that may be encountered in the work.

451

452 **Subbase** - A layer of specified material of specified thickness between the
453 subgrade and a base.

454

455 **Subcontract** - Any written agreement between the Contractor and its
456 subcontractors which contains the conditions under which the subcontractor is to
457 perform a portion of the work for the Contractor.

458

459 **Subcontractor** - An individual, partnership, firm, corporation, joint venture or
460 other legal entity, as licensed or required to be licensed under Chapter 444, Hawaii
461 Revised Statutes, as amended, which enters into an agreement with the
462 Contractor to perform a portion of the work.

463

464 **Subgrade** - The top surface of completed earthwork on which subbase, base,
465 surfacing, pavement, or a course of other material is to be placed.

466

467 **Substantial Completion** - The Status of the project when the Contractor has
468 completed the work, except for the planting period and plant establishment period,
469 and each of the following requirements are met:

- 470
- 471 (1) All traffic lanes (including shoulders, ramps, sidewalks and bike
472 paths) are in their final configuration as designed and the final
473 wearing surface has been installed;
 - 474
 - 475 (2) All operational and safety devices have been installed in accordance
476 with the contract documents including guardrails, end treatments,
477 traffic barriers, required signs and pavement markings, drainage,
478 parapet, and bridge and pavement structures;
 - 479
 - 480 (3) All required illumination and lighting for normal and safe use and
481 operation is installed and functional in accordance with the contract
482 documents;
 - 483
 - 484 (4) All utilities and services are connected and working;
 - 485
 - 486 (5) The need for temporary traffic controls or lane closures at any time
487 has ceased, except for lane closures required for routine
488 maintenance;
 - 489
 - 490 (6) The building, structure, improvement or facility can be used for its
491 intended purpose.

492

493 **Substantial Completion Date** - The date the Substantial Completion is granted
494 by the Engineer in Writing and Contract Time stops.

495

496 **Superintendent** - The employee of the Contractor who is responsible for all the
497 work and is a Contractor's agent for communications to and from the State.

498

499 **Surety** - The qualified individual, firm or corporation other than the Contractor,
500 which executes a bond with and for the Contractor to insure its acceptable
501 performance of the contract.

502

503 **Surfacing** - The uppermost layer of material placed on the traveled way or
504 shoulders. This term is used interchangeably with pavement.

505

506 **Traveled Way** - The portion of the roadway for the movement of vehicles,
507 exclusive of shoulders.

508

509 **Unsuitable Material** - Materials that contain organic matter, muck, humus, peat,
510 sticks, debris, chemicals, toxic matter, or other deleterious materials not suitable
511 for use in earthwork.

512

513 **Utility** - A line, facility, or system for producing, transmitting, or distributing
514 communications, power, electricity, heat, gas, oil, water, steam, waste, or
515 storm water.

516

517 **Utility Owner** - The entity, whether private or owned by a State, Federal, or
518 County governmental body, that has the power and responsibility to grant approval
519 for, or undertake construction work involving a particular utility.

520

521 **Water Pollutant** - Dredged spoil, solid refuse, incinerator residue, sewage,
522 garbage, sewage sludge, munitions, chemical waste, biological materials,
523 radioactive materials, heat, wrecked or discarded equipment, rock, sand, soil,
524 sediment, cellar dirt and industrial, municipal, and agricultural waste.

525

526 **Water Pollution** - **(1)** Such contamination or other alteration of the physical,
527 chemical, or biological properties of any state waters, including change in
528 temperature, taste, color, turbidity, or odor of the waters, or **(2)** Such discharge
529 of any liquid, gaseous, solid, radioactive, or other substances into any state
530 waters, as will or is likely to create a nuisance or render such waters unreasonably
531 harmful, detrimental, or injurious to public health, safety, or welfare, including
532 harm, detriment, or injury to public water supplies, fish and aquatic life and
533 wildlife, recreational purposes and agricultural and industrial research and
534 scientific uses of such waters or as will or is likely to violate any water quality
535 standards, effluent standards, treatment and pretreatment standards, or
536 standards of performance for new sources adopted by the Department of Health.

537

538 **Work** - The furnishing of all labor, material, equipment, and other incidentals
539 necessary or convenient for the successful execution of all the duties and
540 obligations imposed by the contract.

541

542 **Working Day** - A calendar day in which a Contractor is capable of working four or
543 more hours with its normal work force, exclusive of:

544

545 **(1)** Saturdays, Sundays, and recognized legal State holidays and such
546 other days specified by the contract documents as non-working days,

547

548 **(2)** Day in which the Engineer suspends work for four or more hours
549 through no fault of the Contractor.”

550

551

552

553

554

555

END OF SECTION 101

1 Make this section a part of the Standard Specifications:

2
3 **“SECTION 102 - BIDDING REQUIREMENTS AND CONDITIONS**

4
5
6 **102.01 Prequalification of Bidders.** Prospective bidders shall be capable of
7 performing the work for which they are bidding.

8
9 In accordance with HRS Chapter 103D-310, the Department may require
10 any prospective bidder to submit answers to questions contained in the 'Standard
11 Qualification Questionnaire For Prospective Bidders On Public Works Contracts'
12 furnished by the Department, properly executed and notarized, setting forth a
13 complete statement of the experience of such prospective bidder and its
14 organization in performing similar work and a statement of the equipment
15 proposed to be used, together with adequate proof of the availability of such
16 equipment. Whenever it appears to the Department, from answers to the
17 questionnaire or otherwise, that the prospective bidder is not fully qualified and
18 able to perform the intended work, the Department will, after affording the
19 prospective bidder an opportunity to be heard and if still of the opinion that the
20 bidder is not fully qualified to perform the work, refuse to receive or consider any
21 bid offered by the prospective bidder. All information contained in the answers to
22 the questionnaire shall be kept confidential. Questionnaire so submitted shall be
23 returned to the bidders after serving their purpose.

24
25 No person, firm or corporation may bid where (1) the person, firm, or
26 corporation, or (2) a corporation owned substantially by the person, firm, or
27 corporation, or (3) a substantial stockholder or an officer of the corporation, or (4)
28 a partner or substantial investor in the firm is in arrears in payments owed to the
29 State or its political subdivisions or is in default as a surety or failure to do
30 faithfully and diligently previous contracts with the State.

31
32 **102.02 Contents of Proposal Forms.** The Department will furnish
33 prospective bidders with proposal forms posted in HlePRO stating:

- 34
35 (1) The location,
36
37 (2) Description of the proposed work,
38
39 (3) The approximate quantities,
40
41 (4) Items of work to be done or materials to be furnished,
42
43 (5) A schedule of items, and
44
45 (6) The time in which the work shall be completed.
46

47 Papers bound with or attached to the proposal form are part of the
48 proposal. The bidder shall not detach or alter the papers bound with or attached
49 to the proposal when the bidder submits its proposal through HlePRO.
50

51 Also, the bidder shall consider other documents including the plans and
52 specifications a part of the proposal form whether attached or not.
53

54 **102.03 (Unassigned)**
55

56 **102.04 Estimated Quantities.** The quantities shown in the contract are
57 approximate and are for the comparison of bids only. The actual quantity of work
58 may not correspond with the quantities shown in the contract. The Department
59 will make payment to the Contractor for unit price items in accordance with the
60 contract for only the following:
61

62 (1) Actual quantities of work done and accepted, not the estimated
63 quantities; or
64

65 (2) Actual quantities of materials furnished, not the estimated
66 quantities.
67

68 The Department may increase, decrease, or omit each scheduled
69 quantities of work to be done and materials to be furnished. When the
70 Department increases or decreases the estimated quantity of a contract item by
71 more than 15% the Department will make payment for such items in accordance
72 with Subsection 104.06 - Methods of Price Adjustment.
73

74 **102.05 Examination of Contract and Site of Work.** The bidder shall
75 examine carefully the site of the proposed work and contract before submitting a
76 proposal.
77

78 By the act of submitting a bid for the proposed contract, the bidder
79 warrants that:
80

81 (1) The bidder and its Subcontractors have reviewed the contract
82 documents and found them free from ambiguities and sufficient for the
83 purpose intended;
84

85 (2) The bidder and its workers, employees and subcontractors have
86 the skills and experience in the type of work required by the contract
87 documents bid upon;
88

89 (3) Neither the bidder nor its employees, agents, suppliers or
90 subcontractors have relied upon verbal representations from the
91 Department, its employees or agents, including architects, engineers or
92 consultants, in assembling the bid figure; and

93 (4) The basis for the bid figure is solely on the construction contract
94 documents.

95
96 Also, the bidder warrants that the bidder has examined the site of the
97 work. From its investigations, the bidder acknowledges satisfaction on:
98

- 99 (1) The nature and location of the work;
100
101 (2) The character, quality, and quantity of materials;
102
103 (3) The difficulties to be encountered; and
104
105 (4) The kind and amount of equipment and other facilities needed;
106

107 Subsurface information or hydrographic survey data furnished are for the
108 bidders' convenience only. The data and information furnished are the product of
109 the Department's interpretation gathered in investigations made at the specific
110 locations. These conditions may not be typical of conditions at other locations
111 within the project area or that such conditions remain unchanged. Also,
112 conditions found at the time of the subsurface explorations may not be the same
113 conditions when work starts. The bidder shall be solely responsible for
114 assumptions, deductions, or conclusions the bidder may derive from the
115 subsurface information or data furnished.
116

117 If the Engineer determines that the natural conditions differ from that
118 originally anticipated or contemplated by the Contractor in the items of
119 excavation, the State may treat the difference in natural conditions, as falling
120 within the meaning of Subsection 104.02 – Changes.
121

122 **102.06 Preparation of Proposal.** The submittal of its proposal shall be on
123 forms furnished by the Department. The bidder shall specify in words or figures:
124

- 125 (1) A unit price for each pay item with a quantity given;
126
127 (2) The products of the respective unit prices and quantities
128
129 (3) The lump sum amount; and
130
131 (4) The total amount of the proposal obtained by adding the amounts
132 of the several items.
133

134 The words and figures shall be in ink or typed. If a discrepancy occurs
135 between the prices written in words and those written in figures, the prices written
136 in words shall govern.
137

138 When an item in the proposal contains an option to be made, the bidder
139 shall choose in accordance with the contract for that particular item.
140 Determination of an option will not permit the Contractor to choose again.

141
142 The bidder shall sign the proposal properly in ink. A duly authorized
143 representatives of the bidder or by an agent of the bidder legally qualified and
144 acceptable to the Department shall sign, including one or more partners of the
145 bidder and one or more representatives of each entity comprising a joint venture.

146
147 When an agent, other than the officer(s) of a corporation authorized to
148 sign contracts for the corporation or a partner of a partnership, signs the
149 proposals, a 'Power of Attorney' shall be on file with the Department or submitted
150 with the proposal. Otherwise, the Department will reject the proposal as irregular
151 and unauthorized.

152
153 The bidder shall submit acceptable evidence of the authority of the
154 partner, member(s) or officer(s) to sign for the partnership, joint venture, or
155 corporation respectively with the proposal. Otherwise, the Department will reject
156 the proposal as irregular and unauthorized.

157
158 **102.07 Irregular Proposals.** The Department may consider proposals
159 irregular and may reject the proposals for the following reasons:

- 160
161 (1) The proposal is a form not furnished by the Department, altered,
162 or detached;
- 163
164 (2) The proposal contains unauthorized additions, conditions, or
165 alternates. Also, the proposal contains irregularities that may tend to
166 make the proposal incomplete, indefinite, or ambiguous to its meaning;
- 167
168 (3) The bidder adds provisions reserving the right to accept or reject an
169 award. Also, the bidder adds provisions into a contract before an award;
- 170
171 (4) The proposal does not contain a unit price for each pay item listed
172 except authorized optional pay items; and
- 173
174 (5) Prices for some items are out of proportion to the prices for other
175 items.
- 176
177 (6) If in the opinion of the Director, the bidder and its listed
178 subcontractors do not have the Contractor's licenses or combination of
179 Contractor's licenses necessary to complete the work.
- 180

181 Where the prospective bidder is bidding on multiple projects
182 simultaneously and the proposal limits the maximum gross amount of awards
183 that the bidder can accept at one bid letting, the proposal is not irregular if the
184 limit on the gross amount of awards is clear and the Department selects the
185 awards that can be given.

186
187 **102.08 Proposal Guaranty.** The Department will not consider a proposal of
188 \$25,000 or more unless accompanied by:

189
190 (1) A deposit of legal tender; or

191
192 (2) A valid surety bid bond, underwritten by a company licensed to
193 issue bonds in the State of Hawaii, in the form and composed,
194 substantially, with the same language as provided herewith and signed by
195 both parties; or

196
197 (3) A certificate of deposit, share certificate, cashier's check,
198 treasurer's check, teller's check, or official check drawn by, or a certified
199 check accepted by and payable on demand to the State by a bank,
200 savings institution, or credit union insured by the Federal Deposit
201 Insurance Corporation (FDIC) or the National Credit Union Administration
202 (NCUA).

203
204 (a) The bidder may use these instruments only to a maximum of
205 \$100,000.

206
207 (b) If the required security or bond amount totals over \$100,000
208 more than one instrument not exceeding \$100,000 each and issued
209 by different financial institutions shall be acceptable.

210
211 (c) The instrument shall be made payable at sight to the
212 Department.

213
214 (d) Proposal Guaranty listed in (1) and (3) shall be in its original
215 form, and shall be received at the Contracts Office, Department of
216 Transportation, 869 Punchbowl Street, Honolulu, Hawaii 96813
217 before the bid deadline.

218
219 In accordance with HRS Chapter 103D-323, the above shall be in a sum
220 not less than 5% of the amount bid.

221
222 **102.09 Delivery of Proposal.** The bidder shall submit the proposal in
223 HlePRO. Bids received after said due date and time shall not be considered.
224 Original bid documents do not have to be submitted. Award will be made based
225 on proposals submitted in HlePRO.

227 **102.10 Withdrawal or Revision of Proposals.** A bidder may withdraw or
228 revise a proposal after the bidder submits the proposal in HlePRO. Withdrawal
229 or revision of proposal must be completed before the time set for the receiving of
230 bids.

231
232 **102.11 Public Opening of Proposals.** Not applicable.

233
234 **102.12 Disqualification of Bidders.** The Department may disqualify a bidder
235 and reject its proposal for the following reasons:

- 236
- 237 (1) Submittal of more than one proposal whether under the same or
238 different name.
 - 239
 - 240 (2) Evidence of collusion among bidders. The Department will not
241 recognize participants in collusion as bidders for any future work of the
242 Department until such participants are reinstated as qualified bidders.
 - 243
 - 244 (3) Lack of proposal guaranty.
 - 245
 - 246 (4) Submittal of an unsigned or improperly signed proposal.
 - 247
 - 248 (5) Submittal of a proposal without a listing of subcontractors or
249 containing only a partial or incomplete listing of subcontractors.
 - 250
 - 251 (6) Submittal of an irregular proposal in accordance with Subsection
252 102.07 - Irregular Proposals.
 - 253
 - 254 (7) Evidence of assistance from a person who has been an employee
255 of the agency within the preceding two years and who participated while in
256 State office or employment in the matter with which the contract is directly
257 concerned, pursuant to HRS Chapter 84-15.
 - 258
 - 259 (8) Suspended or debarred in accordance with HRS Chapter 104-25.
 - 260 (9) Failure to complete the prequalification questionnaire, if applicable.
 - 261
 - 262 (10) Failure to attend the mandatory pre-bid meeting, if applicable.

263
264 **102.13 Material Guaranty.** The successful bidder may be required to furnish
265 a statement of the composition, origin, manufacture of materials, and samples.

266
267 **102.14 Substitution of Materials and Equipment Before Bid Opening.** See
268 Subsection 106.13 for Substitution Of Materials and Equipment After Bid
269 Opening.

270

271 **(A) General.** When brand names of materials or equipment are
272 specified in the contract documents, they are to indicate a quality, style,
273 appearance, or performance and not to limit competition. The bidder shall
274 base its bid on one of the specified brand names unless alternate brands
275 are qualified as equal or better in an addendum. Qualification of such
276 proposed alternate brands shall be submitted **via email to the Contact**
277 **person listed in HlePRO for the solicitation and also post a question in**
278 **HlePRO under the question/answer tab referencing the email with the**
279 **request.** The request must be posted in HlePRO no later than 14
280 calendar days before the bid opening date, not including the bid opening
281 date

282
283 An addendum will be issued to inform all prospective bidders of any
284 accepted substitution in accordance with Subsection 102.17 – Addenda .
285

286 **(B) Statement of Variances.** The statement of variances must list all
287 features of the proposed substitution that differ from the contract
288 documents and must further certify that the substitution has no other
289 variant features. The brochure and information submitted shall be clearly
290 marked showing make, model, size, options, and any other features
291 requested by the Engineer and must include sufficient evidence to
292 evaluate each feature listed as a variance. A request will be denied if
293 submitted without sufficient evidence. If after installing the substituted
294 product, an unlisted variance is discovered, the Contractor shall
295 immediately replace the product with a specified product at no increase in
296 contract price and contract time.

297
298 **(C) Substitution Denial.** Any substitution request not complying with
299 the above requirements will be denied.

300
301 **102.15 Preferences.**

302
303 **(A) Preference for Hawaii Products.** The bidder's attention is
304 directed to Sections 103D-1001 and 103D-1002, HRS and Subchapter 1,
305 Chapter 124, Subtitle 11 of Title 3, HAR which provide preferences for
306 Hawaii Products. According to Section 103D-1002, HRS, the bidder may
307 examine the Hawaii Products List at the State Procurement Office, State
308 Office Building, 1151 Punchbowl Street, Honolulu, Hawaii 96813.

309
310 If a product listed in the Hawaii Products List is available and meets
311 project specifications, such product will be designated in the contract
312 documents as a qualified product which may be used in the performance
313 of the project.

314

315
316
317
318
319
320
321
322
323
324
325
326
327
328
329
330
331
332
333
334
335
336
337
338
339
340
341
342
343
344
345
346
347
348
349
350
351
352
353
354
355
356
357
358
359

If the bidder intends to claim preference for products on the Hawaii Product List and such is not listed, the bidder shall immediately notify the Contracts Office, Department of Transportation, so the Engineer may take corrective or other appropriate actions.

It is further understood by the bidder that if the bidder elects to furnish qualified Hawaii Products, and is awarded the contract, then fails to use such products or meet the requirements of such preference, the bidder shall be subject to the statutory penalties, provided in HRS Chapter 103D-1002, and such other remedies as may be available to the State.

For the purpose of determining the lowest bid price only, the provisions of HRS Chapter 103D-1002 shall apply. Any contract awarded or executed in violation of HRS Chapter 103D-1002 shall be void and no payment shall be made on account of such contract.

(B) Preferences for Apprenticeship Programs. In accordance with ACT 17, SLH 2009 – Apprenticeship Program, a 5% bid adjustment for bidders that are parties to apprenticeship agreements pursuant to Hawaii Revised Statutes (HRS) Section 103-55.6 may be applied to the bidder's price for evaluation purposes. These procedures apply to public works projects with estimated cost of \$250,000 or more and entered into under the provisions of HRS Chapter 103.

The following provisions apply to this Apprenticeship Program.

(1) Definitions

(a) “Apprenticeable trade”, HRS Section 103-55.6 (c), shall have the same meaning as ‘apprenticeable occupation’ pursuant to Hawaii Administrative Rules (HAR) Section 30-1-5.

(b) “Department” means the department of labor and industrial relations.

(c) “Director” means the director of labor and industrial relations.

(d) “Employ” means the employment of a person in an employer-employee relations.

(e) “Governmental body” means as defined in HRS Section 103D-104.

360
361
362
363
364
365
366
367
368
369
370
371
372
373
374
375
376
377
378
379
380
381
382
383
384
385
386
387
388
389
390
391
392
393
394
395
396
397
398
399
400
401
402
403

(f) “Party to an apprenticeship agreement” means party to a registered apprenticeship program with the department of labor and industrial relations.

(g) “Preference” means the 5% by which the qualified bidder's offer amount would be decreased for evaluation purposes.

(h) “Public work” shall be as defined in HRS Section 104-2 and HAR Section 12-22-1.

(i) “Registered apprenticeship program” means a construction trade program approved by the department pursuant to HAR Section 12-30-1 and Section 12-30-4.

(j) “Sponsor” means an operator of an apprenticeship program and in whose name the program is approved and registered with the department of labor and industrial relations pursuant to HAR Section 12-30-1.

(k) Offeror – Entity/bidder submitting a proposal to undertake a project.

(l) Procurement Officer – Director of Transportation or his authorized representative.

(2) Qualification Procedures

(a) Any bidder seeking the preference must be a party to an apprenticeship agreement registered with the department at the time the offer is made for each apprenticeable trade the bidder will employ to construct the public works projects for which the offer is being made.

1. The apprenticeship agreement shall be registered and conform to the requirements of HRS Chapter 372.

2. Subcontractors do not have to be a party to an apprenticeship agreement for the bidder to obtain the preference.

3. The bidder is not required to have apprentices in its employ at the time of submittal of an offer to qualify for the preference.

404
405
406
407
408
409
410
411
412
413
414
415
416
417
418
419
420
421
422
423
424
425
426
427
428
429
430
431
432
433
434
435
436
437
438
439
440
441
442
443
444
445
446
447
448

- (b)** The department shall:
1. Develop and maintain a list of construction trades in registered apprenticeship programs which conform to HRS Chapter 372; and
 2. Electronically post the list; including any amendments, on the department website (<http://labor.hawaii.gov>).
- (c)** Bidder is responsible to comply with all submission requirements for registration of its apprenticeship program before requesting a preference.
- (d)** Bidder shall provide a certification by the sponsor of the respective registered apprenticeship programs covering the relevant trade(s) for the public works project.
- (e)** *Certification Form 1* issued by the department shall include:
1. Contractor information;
 2. Solicitation reference;
 3. Trade(s);
 4. Date and name of apprenticeship program;
 5. Signature of authorized training coordinator or training trust fund administrator certifying that the contractor is a participant in the program, and that the program is registered with the department;
 6. Contract information for sponsor's authorized representative signing the form;
 7. Number of apprentices enrolled in the program, number who successfully completed the apprenticeship program in the past 12 months, including whether the contractor is signatory to a collective bargaining agreement for that trade, or if not, provide for attachment of a copy of the agreement between the contractor and the program.

449
450
451
452
453
454
455
456
457
458
459
460
461
462
463
464
465
466
467
468
469
470
471
472
473
474
475
476
477
478
479
480
481
482
483
484
485
486
487
488
489
490
491
492

(3) Solicitation Procedures.

(a) If the NTB indicates that this project is covered by this preference, and the offer is less than \$250,000 this preference will still be applicable in determining the lowest bidder.

(b) A claim for this preference must include the following:

1. Allow bidder seeking to claim the preference to state the trades the bidder will employ to perform the work;
2. For each trade to be employed to perform the work, the bidder shall submit a completed signed original *Certification Form 1* verifying participation in an apprenticeship program registered with the department.
3. The *Certification Form 1* shall be authorized by an apprenticeship sponsor of the department's list of registered apprenticeship programs. The authorization shall be an original signature by an authorized official of the apprenticeship sponsor; and
4. The completed *Certification Form 1* for each trade must be submitted by the bidder with the offer. Previous certifications shall not apply unless allowed by the solicitation.

(c) Upon receiving *Certification Form 1*, the procurement officer will verify with the department that the apprenticeship program is on the list of apprenticeship programs registered with the department. If the programs are not confirmed by the department, the bidder will not qualify for the preference.

(4) Evaluation and Contract Award

(a) If the bidder certifies participation in an apprenticeship program for each trade which will be employed by the bidder for the project, the procurement officer shall apply the preference and decrease the bidder's total bid amount by five per cent (5%) for evaluation purposes.

493
494
495
496
497
498
499
500
501
502
503
504
505
506
507
508
509
510
511
512
513
514
515
516
517
518
519
520
521
522
523
524
525
526
527
528
529
530
531
532
533
534
535
536
537
538

(b) Should the bidder qualify for other statutory preferences (for example, Hawaii products), all applicable preferences shall be applied to the bidder's price.

(c) The contract amount shall be the original offer amount, exclusive of any preference; the preference is only for evaluation purposes.

(d) Any claims challenging a bidder's representation that the bidder is a participant in an apprenticeship program(s) as claimed, shall be submitted to the procurement officer. The procurement officer will refer the challenge to the department of labor and industrial relations who shall investigate any such claims and shall make a determination.

(5) Contract Administration

(a) For the duration of a contract awarded utilizing the apprenticeship preference, the contractor shall certify each month that work is being conducted on the project, that it continues to be a participant in the relevant apprenticeship program for each trade it employs.

(b) Monthly certification shall be made on *Monthly Certification Form 2* prepared and made available by the department, be a signed original by the respective apprenticeship program sponsors authorized official, and submitted by the contractor with its monthly payment requests.

(c) Should the contractor fail or refuse to submit its monthly certification forms, or at any time during the construction of the project, cease to be a part to a registered apprenticeship agreement for each apprenticeable trades the contractor employs, or will employ, the contractor will be subject to the following sanctions:

1. Withholding of the requested payment until the required form(s) are submitted;
2. Temporary or permanent cessation of work on the project , without recourse to breach of contract claims by the contractor; provided the agency shall be entitled to restitution for nonperformance or liquidated damages claims; or

539
540
541
542
543
544
545
546
547
548
549
550
551
552
553
554
555
556
557
558
559
560
561
562
563
564
565
566
567
568
569
570
571
572
573
574
575
576
577
578
579
580
581

3. Proceed to debar or suspend pursuant to HRS Section 103D-702.

(d) If events such as “acts of God,” acts of a public enemy, acts of the State or any other governmental body in its sovereign or contractual capacity, fires, floods, epidemics, freight embargoes, unusually severe weather, or strikes or other labor disputes prevent the contractor from submitting the certification forms, the contractor shall not be penalized as provided herein, provided the contractor completely and expeditiously complies with the certification process when the event is over.

This subsection shall not apply when its application will disqualify the State from receiving federal funds or aid.

(C) Preference for Recycled Products. Recycled Products shall not apply to this project.

(D) Evaluation Procedures and Contract Award. For bid evaluation, the Engineer will evaluate the bids by applying the applicable preferences selected by the bidders according to the contract. The Engineer will base the calculations for adjustments upon the original bid prices offered. If more than one preference applies, the evaluated bid price shall be the sum of the original bid price plus applicable preference adjustments.

If a bidder has designated use of a Hawaii Product and fails to provide the product, the contract will become void and no payments will be made.

The Engineer will award the contract to the responsible bidder submitting the responsive bid with the lowest evaluated bid price. The contract amount of the contract awarded shall be the original bid price offered exclusive of any preference.

102.16 Certification for Safety and Health Program for Bids in excess of \$100,000. In accordance with HRS Chapter 396-18, the bidder or offeror, by signing and submitting this proposal, certifies that a written safety and health plan for this project will be available and implemented by the notice to proceed date for this project. Details of the requirements of this plan may be obtained from the State Department of Labor and Industrial Relations, Occupational Safety and Health Division (HIOSH).

582 **102.17 Addenda.** Addenda issued shall become part of the contract
583 documents. Addenda to the bid documents will be provided to all prospective
584 bidders via HlePRO. Each addendum shall be an addition to the contract
585 documents. The terms and requirements of the bid documents (i.e. drawings,
586 specifications and other bid and contract documents) cannot be changed prior to
587 the bid opening except by a duly issued addendum.”

588
589
590
591
592

END OF SECTION 102

1 Make this section a part of the Standard Specifications:
2

3 **“SECTION 103 - AWARD AND EXECUTION OF CONTRACT**
4

5
6 **103.01 Consideration of Proposals.** The Department will compare the
7 proposals in terms of the summation of the products of the approximate quantities
8 and the unit bid prices after the submittal date and time established in HlePRO. If
9 a discrepancy occurs between the unit bid price and the bid price, the unit bid price
10 shall govern.

11
12 The Department reserves the right to reject proposals, waive technicalities
13 or advertise for new proposals, if the rejection, waiver, or new advertisement favors
14 the Department.

15
16 **103.02 Award of Contract.** The award of contract, if it be awarded, will be
17 made within 60 calendar days after the opening of bids, to the lowest responsible
18 bidder whose proposal complies with all the requirements. (Through HlePRO).
19 The successful bidder will be notified by letter mailed to the address shown in its
20 proposal, that its proposal has been accepted, and that it has been awarded the
21 contract.

22
23 **(1) Requirement for Award.** To be eligible for award, the apparent
24 low bidder will be contacted to submit copies of the documents listed
25 below to demonstrate compliance with HRS Section 103D-310(c). The
26 documents should be submitted to the Department as soon as possible
27 (within 14 days after bid opening unless otherwise specified in the
28 invitation for bids or an extension is granted in writing by the
29 Department). If a valid certificate/clearance is not submitted on a timely
30 basis for award of a contract, a bidder otherwise responsive and
31 responsible may not receive the award. See also Subsection 108.03 –
32 Preconstruction Data Submittal.

33
34 The Department may request the bidders to allow the Department
35 to consider the bids for the issuance of an award beyond the 60 calendar
36 day period. Agreement to such an extension must be made by a bidder
37 in writing. Only bidders who have agreed to such an extension will be
38 eligible for the award.
39

40 **(A) Tax Clearance.** Pursuant to HRS Sections 103D-310(c), 103-53
41 and 103D-328, the successful bidder shall be required to submit a certified
42 copy of its tax clearance issued by the Hawaii State Department of Taxation
43 (DOTAX) and the Internal Revenue Service (IRS) to demonstrate its
44 compliance with HRS Chapter 237. A tax clearance is valid for six (6)
45 months from the most recent approval stamp date on the tax clearance and
46 must be valid on the bid's first legal advertisement date or any date
47 thereafter up to the bid opening date.

48
49 FORM A6, TAX CLEARANCE CERTIFICATE, is available at
50 the following website:

51
52 <https://tax.hawaii.gov/>

53
54 To receive DOTAX Forms by fax or mail, phone
55 (808) 587-7572 or 1-800-222-7572.

56
57 The application for the Tax Clearance Certificate is the responsibility
58 of the bidder and must be submitted directly to the DOTAX or IRS. The
59 approved certificate may then be submitted to the Department.

60
61 **(B) DLIR Certificate of Compliance.** Pursuant to HRS Section 103D-
62 310(c), the successful bidder shall be required to submit a copy (faxed
63 copies are acceptable) of its approved certificate of compliance issued by
64 the Hawaii State Department of Labor and Industrial Relations (DLIR) to
65 demonstrate its compliance with unemployment insurance (HRS Chapter
66 383), workers' compensation (HRS Chapter 386), temporary disability
67 insurance (HRS Chapter 392), and prepaid health care (HRS Chapter 393).
68 The certificate is valid for six (6) months from the most recent approval
69 stamp date on the certificate and must be valid on the bid's first legal
70 advertisement date or any date thereafter up to the bid opening date. For
71 certificates which receive a "pending" approval stamp, a DLIR approval
72 stamp is required prior to the issuance of the Notice to Proceed.

73
74 FORM LIR#27, APPLICATION FOR CERTIFICATE OF
75 COMPLIANCE WITH SECTION 3-122-112, HAR, is available at the
76 following website:

77
78 <http://labor.hawaii.gov/>

79
80 More information is available by calling the DLIR Unemployment Insurance
81 Division at (808) 586-8926.

82
83 Inquiries regarding the status of a LIR#27 Form may be made by
84 calling the DLIR Disability Compensation Division at (808) 586-9200.

86 The application for the Certificate of Compliance is the responsibility
87 of the bidder and must be submitted directly to the DLIR. The approved
88 certificate may then be submitted to the Department.
89

90 **(C) DCCA Certificate of Good Standing.** Pursuant to HRS Section
91 103D-310(c), the successful bidder shall be required to submit a copy
92 (faxed copies are acceptable) of its approved Certificate of Good Standing
93 issued by the Hawaii State Department of Commerce and Consumer Affairs
94 (DCCA), Business Registration Division (BREG) to demonstrate that it is
95 either:
96

97 (1) Incorporated or organized under the laws of the State; or
98

99 (2) Registered to do business in the State as a separate branch
100 or division that is capable of fully performing under the contract.
101

102 The Certificate of Good Standing is valid for six (6) months from the
103 approval date on the certificate and must be valid on the bid's first legal
104 advertisement date or any date thereafter up to the bid opening date. A
105 Hawaii business that is a sole proprietorship, however, is not required to
106 register with the BREG, and therefore not required to submit a Certificate of
107 Good Standing. Bidders are advised that there are costs associated with
108 registering and obtaining a Certificate of Good Standing from the DCCA.
109

110 To purchase a CERTIFICATE OF GOOD STANDING, go to On-Line
111 Services at the following website:
112

113 <http://cca.hawaii.gov/>
114

115 The application for the Certificate of Good Standing is the
116 responsibility of the bidder and must be submitted directly to the DCCA.
117 The approved certificate may then be submitted to the Department.
118

119 **(D) Hawaii Compliance Express (HCE).** In lieu of the certificates
120 referenced above, the bidder may make available proof of compliance
121 through the Hawaii Compliance Express or any other designated
122 certification process. Bidders may apply and register at the "Hawaii
123 Compliance Express" website:
124

125 <https://vendors.ehawaii.gov/hce/>
126

127 **103.03 Cancellation of Award.** The Department reserves the right to cancel
128 the award of contracts before the execution of said contract by the parties. There
129 will be no liability to the awardee and to other bidders.
130

131 **103.04 Return of Proposal Guaranty.** The Department will return the proposal
132 guaranties, except those of the three lowest bidders, after the Department checks
133 the proposals. The Department will return the proposal guaranties of the remaining
134 two lowest bidders, not awarded the contract, within five working days following
135 the execution of the contract. The Department will return the successful bidder's
136 proposal guaranty after the successful bidder furnishes a bond and executes the
137 contract.

138
139 **103.05 Requirement of Contract Bond.** At the time of execution of the
140 contract, the successful bidder shall file a good and sufficient performance bond
141 and a payment bond on the forms furnished by the Department conditioned for
142 the full and faithful performance of the contract in accordance with the terms and
143 intent thereof and for the prompt payment to all others for all labor and material
144 furnished by them to the bidder and used in the prosecution of the work provided
145 for in the contract. The bonds shall be of an amount equal to 100 percent of the
146 amount of the contract price and include 5 percent of the contract amount
147 estimated to be required for extra work. The bidder shall limit the acceptable
148 performance and payment bonds to the following:

- 149
150 (a) Legal tender;
151
152 (b) Surety bond underwritten by a company licensed to issue bonds in
153 the State of Hawaii; or
154
155 (c) A certificate of deposit; share certificate; cashier's check; treasurer's
156 check, teller's check drawn by or a certified check accepted by and payable
157 on demand to the State by a bank savings institution or credit union insured
158 by the Federal Deposit Insurance Corporation (FDIC) or the National Credit
159 Union Administration (NCUA).

- 160
161 1. The bidder may use these instruments only to a maximum of
162 \$100,000.
163
164 2. If the required security or bond amount totals over \$100,000
165 more than one instrument not exceeding \$100,000 each and issued
166 by different financial institutions shall be acceptable.
167

168 Such bonds shall also by the terms inure to the benefit of any and all
169 persons entitled to file claims for labor done or material furnished in the work so as
170 to give them a right of action as contemplated by HRS Section 103D-324.
171

172 **103.06 Execution of the Contract.** The contract bond and HRS Chapter 104
173 - Compliance Certificate, similar to a copy of the same annexed hereto, shall be
174 executed by the successful bidder and returned within ten days after the award of
175 the contract or within such further time as the Director may allow after the bidder
176 has received the contract for execution.

177 The contract shall not bind the Department unless said parties execute the
178 contract and the Director of Finance endorses the bidder's certificate in
179 accordance with HRS Section 103-39.

180

181 **103.07 Failure to Execute Contract.** Failure to execute the contract and file
182 acceptable bonds shall be cause for the cancellation of the award in accordance
183 with Subsection 103.06 - Execution of the Contract. Also, the Contractor forfeits
184 the proposal guaranty which becomes the property of the Department. This is not
185 a penalty, but liquidated damages sustained by the State. The Department may
186 then make award to the next lowest responsible bidder or the Department may
187 readvertise and construct the work under contract.”

188

189

190

191

192

END OF SECTION 103

1 **SECTION 104 – SCOPE OF WORK**
2

3 Make the following amendment to said Section:
4

5 **(I) Amend Section 104.11(B) Contractor’s Duty to Locate and Protect**
6 **Utility** by adding the following after line 291:
7

8 “**(4)** The Contractor shall contact the Hawaii One Call Center at 811 prior
9 to any execution in a public right of way or on private property.”
10

11 **(II) Amend Section 104.06 Methods of Price Adjustment** as follows:
12

13 **“104.06 Methods of Price Adjustment.** Any adjustment in the contract price
14 pursuant to a change or claim shall be made in one or more of the following
15 ways:
16

17 **(1)** By written agreement on a fixed price adjustment before
18 commencement of the pertinent performance.
19

20 **(2)** By unit prices or other price adjustments specified in the contract or
21 subsequently agreed upon before commencement of the pertinent
22 performance.
23

24 **(3)** The Engineer may base the adjustment for a lump sum item on a
25 calculated proportionate unit price. The Engineer will calculate the
26 proportionate unit price by dividing the original contract lump sum price by
27 the actual or original estimated quantity established by the contract
28 documents.
29

30 **(4)** In any other lawful manner as the parties may mutually agree upon
31 before commencement of the pertinent performance.
32

33 **(5)** At the sole option of the Engineer, work may be paid for on a force
34 account basis in accordance with Subsection 109.06 - Force Account
35 Provisions and Compensation.
36

37 **(6)** By the cost variations attributable to the events or situations with
38 adjustment of profit and fee, all as specified in the contract or
39 subsequently agreed upon before commencement of the pertinent
40 performance.
41

42 **(7)** In the absence of agreement by the parties:
43

44 **(A)** For change orders with value not exceeding \$50,000 by
45 documented actual costs of the work, allowing for overhead and
46 profit as set forth in Section 109.05 - Allowances for Overhead and
47 Profit. A change order shall be issued within fifteen days of

48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84

submission by the contractor of proper documentation of completed force account work, whether periodic (conforming to the applicable billing cycle) or final. The Engineer shall return any documentation that is defective, to the contractor within fifteen days after receipt, with a statement identifying the defect; or

(B) For change orders with value exceeding \$50,000 by a unilateral determination by the Engineer of the costs attributable to the events or situations with adjustment of profit and fee, all as computed by the Engineer in accordance with applicable sections of HAR Chapters 3-123 and 3-126, and Section 109.05 - Allowances for Overhead and Profit. When a unilateral determination has been made, a unilateral change order shall be issued within ten days. Upon receipt of the unilateral change order, if the contractor does not agree with any of the terms or conditions, or the adjustment or nonadjustment of the contract time or contract price, the contractor shall file a notice of intent to claim within thirty days after the receipt of the written unilateral change order. Failure to file a protest within the time specified shall constitute agreement on the part of the contractor with the terms, conditions, amounts, and adjustment or nonadjustment of the contract time or the contract price set forth in the unilateral change order.

A contractor shall be required to submit cost or pricing data if any adjustment in contract price is subject to the provisions of HAR Chapter 3-122, Subchapter 15. A fully executed change order or other document permitting billing for the adjustment in price under any method listed in Subsections 104.06(1) through 104.06(7) shall be issued within ten days after agreement on the method of adjustment."

END OF SECTION 104

1 **SECTION 105 – CONTROL OF WORK**

2
3 Make the following amendments to said Section:

4
5
6 (I) Amend **105.01 – Authority** to read as follows:

7
8 **“105.01 Authority.**

9
10 **(A) Authority of the Engineer.** The Engineer is the representative of
11 the Director and has all the authority of the Director with respect to the
12 contract. The Engineer will make decisions on all questions that may
13 arise regarding the contract, such as, but not limited to:

- 14
15 (1) Interpretation of the contract documents.
16
17 (2) Acceptability of the materials furnished and work performed.
18
19 (3) Manner of performance and rate of progress of the work.
20
21 (4) Acceptable fulfillment of the contract on the part of the
22 Contractor.
23
24 (5) Compensation under the contract.
25

26 The Engineer’s decisions on questions, claims, and disputes will be
27 final and conclusive subject to Subsection 107.15 – Disputes and Claims.
28

29 The Engineer may delegate specific authority to act for the
30 Engineer to a specific person or persons. Such delegation of authority
31 shall be established in writing and shall become effective upon delivery to
32 the Contractor.
33

34 **(B) Authority of the Inspectors.** Inspectors, as a representative of
35 the Engineer or other agencies, will inspect the work done and materials
36 furnished. Such inspection may extend to the preparation, fabrication or
37 manufacture of the materials to be used. The Inspector does not have
38 authority vested in the Engineer unless specifically delegated in writing.
39 The Inspector may not alter or waive the provisions of the contract, issue
40 instructions contrary to the contract, or act as agent or representative of
41 the Contractor.
42

43 Failure of an Inspector at any time to reject non-conforming work
44 shall not be considered a waiver of the State’s right to require work in strict
45 conformity with the contract documents as a condition of final acceptance.
46

47 **(C) Authority of the Consultant and Construction Management.**
48 The State may engage consultants and construction managements to
49 perform duties in connection with the work. Unless otherwise specified in
50 writing to the Contractor, such retained consultants and construction
51 managements shall have no greater authority than an Inspector.”
52

53 **(II) Amend Subsection 105.02 - Submittals** by revising the first paragraph
54 from lines 52 to 61 to read as follows:
55

56 **“105.02 Submittals.** The contract contains the description of various items
57 that the Contractor must submit to the Engineer for review and acceptance. The
58 Contractor shall review all submittals for correctness, conformance with the
59 requirements of the contract documents and completeness before submitting
60 them to the Engineer. The submittal shall indicate the contract items and
61 specifications subsections for which the submittal is provided. The submittal
62 shall be legible and clearly indicate what portion of the submittal is being
63 submitted for review. The Contractor shall provide six copies of the required
64 submissions at the earliest possible date.”
65

66 **(III) Amend Subsection 105.08 (A) - Furnishing Drawings and Special**
67 **Provisions** to read as follows:
68

69 **“(A) Furnishing Drawings and Special Provisions.** The State will
70 furnish the Contractor **an electronic set of the special provisions and**
71 **plans.”** The Contractor shall have and maintain at least one set of plans
72 and specifications on the work site, at all times.
73

74 **(IV) Amend Subsection 105.14(D) – No Designated Storage Area** from lines
75 421 to 432 to read as follows:
76

77 **“(D) No Designated Storage Area.** If no storage area is designated
78 within the contract documents, materials and equipment may be stored
79 anywhere within the State highway right-of-way, provided such storage
80 and access to and from such site, within the sole discretion of the
81 Engineer, does not create a public or traffic hazard or an impediment to
82 the movement of traffic.”
83

84 **(V) Amend 105.16(A) – Subcontract Requirements** by adding the following
85 paragraph after line 483:
86

87 The 'Specialty Items' of work for this project are as follows:
88

89
90
91
92
93
94
95
96
97
98
99
100
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131

Section No.	Description
401	Contract Item No. 401.0100 under Section 401 – Hot Mix Asphalt Pavement
540	All Contract Items under Section 540 – Very Early Strength Latex Modified Concrete (VESLMC)
622	All Contract Items under Section 622 – Roadway and Sign Lighting System
623	Traffic Signal System
629	All Contract Items under Section 629 - Pavement Markings
631	All Contract Items under Section 631 - Traffic Control Regulatory, Warning, and Miscellaneous Signs
647	All Contract Items under Section 647 - Fiber Optic Cable
650	All Contract Items under Section 650 – Curb Ramps
652	All Contract Items under Section 652 – Horizontal Directional Drilling
660	All Contract Items under Section 660 – Gas System
680	All Contract Items under Section 680 – Electric and Communication Systems”

(VI) Amend **Subsection 105.16(B)** – **Substituting Subcontractors** by revising the second sentence from line 490 to line 493 to read:

“Contractors may enter into subcontracts only with subcontractors listed in the proposal or with non-listed joint contractors/subcontractors permitted under Subsection 102.06 – Preparation of Proposal.”

END OF SECTION 105

1 **SECTION 106 – MATERIAL RESTRICTIONS AND REQUIREMENTS**

2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Make the following amendment to said Section:

(I) Amend **106.05(B) – Deviation** by revising the third sentence from line 106 to 108 to read as follows:

“Any deviations will be subject to Subsection 102.14 – Substitution of Materials and Equipment Before Bid Opening.

(II) Amend **106.11 Steel and Iron Construction Material** from line 238 to line 277 to read as follows

“106.11 Steel and Iron Construction Material. (Not Applicable)”

END OF SECTION 106

1 **SECTION 107 - LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC**

2
3 Make the following amendments to said Section:

4
5
6 **(I)** Amend **Section 107.01 Insurance Requirements** from lines to 81 to
7 read as follows:

8
9 **“(A) Obligation of Contractor.** Contractor shall not commence any
10 work until it obtains, at its own expense, all required insurance described
11 herein. Such insurance shall be provided by an insurance company
12 authorized by the laws of the State to issue such insurance in the State of
13 Hawaii. Coverage by a “Non-Admitted” carrier is permissible provided the
14 carrier has a Best’s Rating of “A-VII” or better. The Contractor shall
15 maintain and ensure all insurance policies are current for the full period of
16 the contract until final acceptance of the work by the State.

17
18 The Certificate of Insurance shall contain: a clause that it is agreed
19 that any insurance maintained by the State of Hawaii will apply in excess
20 of, and not contribute with, insurance provided by this policy; and shall be
21 accompanied by endorsement form CG2010 or equivalent naming the
22 State as an additional insured to the policy which status shall be
23 maintained for the full period of the contract until final acceptance of the
24 work by State.

25
26 The Contractor shall obtain all required insurance as part of the
27 contract price. Where there is a requirement for the State of Hawaii and
28 its officers and employees to be named as additional insureds under any
29 Contractor’s insurance policy, before the State of Hawaii issues the Notice
30 to Proceed, the Contractor shall obtain and submit to the Engineer a
31 Certificate of Insurance and a written policy endorsement that confirms the
32 State of Hawaii and its officers and employees are additional insureds for
33 the specific State project number and project title under such insurance
34 policies. The written policy endorsement must be issued by the insurance
35 company insuring the Contractor for the specified policy type or by an
36 agent of such insurance company who is vested with the authority to issue
37 a written policy endorsement. The insurer’s agent shall also submit
38 written confirmation of such authority to bind the insurer. Any delays in
39 the issuance of the Notice to Proceed attributed to the failure to obtain the
40 proof of the State of Hawaii and its officers and employees’ additional
41 insured status shall be charged to the Contractor.
42

43 A mere Certificate of Insurance issued by a broker who represents
44 the Contractor (but not the Contractor's insurer), or by any other party who
45 is not authorized to contractually name the State as an additional insured
46 under the Contractor's insurance policy, is not sufficient to meet the
47 Contractor's insurance obligations.
48

49 Certificates shall contain a provision that coverages being certified
50 will not be cancelled or materially changed without giving the Engineer at
51 least thirty (30) days prior written notice. Contractor will immediately
52 provide written notice to the Director should any of the insurance policies
53 evidenced on its Certificate of Insurance form be cancelled, reduced in
54 scope or coverage, or not renewed upon expiration. Should any policy be
55 canceled before final acceptance of the work by the State, and the
56 Contractor fails to immediately procure replacement insurance as
57 specified, the State, in addition to all other remedies it may have for such
58 breach, reserves the right to procure such insurance and deduct the cost
59 thereof from any money due or to become due to the Contractor.
60

61 Nothing contained in these insurance requirements is to be
62 construed as limiting the extent of Contractor's responsibility for payment
63 of damages resulting from its operations under this contract, including the
64 Contractor's obligation to pay liquidated damages, nor shall it affect the
65 Contractor's separate and independent duty to defend, indemnify and hold
66 the State harmless pursuant to other provisions of this contract. In no
67 instance will the State's exercise of an option to occupy and use
68 completed portions of the work relieve the Contractor of its obligation to
69 maintain the required insurance until the date of final acceptance of the
70 work.
71

72 All insurance described herein shall be primary and cover the
73 insured for all work to be performed under the contract, all work performed
74 incidental thereto or directly or indirectly connected therewith, including
75 but not limited to traffic detour work, barricades, warnings, diversions, lane
76 closures, and other work performed outside the work area and all change
77 order work.
78

79 The Contractor shall, from time to time, furnish the Engineer, when
80 requested, satisfactory proof of coverage of each type of insurance
81 required covering the work. Failure to comply with the Engineer's request
82 may result in suspension of the work, and shall be sufficient grounds to
83 withhold future payments due the Contractor and to terminate the contract
84 for Contractor's default.
85

86 **(B) Types of Insurance.** Contractor shall purchase and
87 maintain insurance described below which shall provide coverage
88 against claims arising out of the Contractor's operations under the

89 contract, whether such operations be by the Contractor itself or by any
90 subcontractor or by anyone directly or indirectly employed by any of
91 them or by anyone for whose acts any of them may be liable.
92

93 **(1) Workers' Compensation.** The Contractor shall obtain
94 worker's compensation insurance for all persons whom they
95 employ in carrying out the work under this contract. This insurance
96 shall be in strict conformity with the requirements of the most
97 current and applicable State of Hawaii Worker's Compensation
98 Insurance laws in effect on the date of the execution of this contract
99 and as modified during the duration of the contract.
100

101 **(2) Auto Liability.** The Contractor shall obtain Auto Liability
102 Insurance covering all owned, non-owned and hired autos with a
103 Combined single Limit of not less than \$1,000,000 per occurrence
104 for bodily injury and property damage with the State of Hawaii
105 named as additional insured. Refer to SPECIAL CONDITIONS for
106 any additional requirements.
107

108 **(3) General Liability.** The Contractor shall obtain General
109 Liability insurance with a limit of not less than \$2,000,000 per
110 occurrence and in the Aggregates for each of the following:
111

- 112 (a) Products - Completed/Operations Aggregate,
- 113
- 114 (b) Personal & Advertising Injury, and
- 115
- 116 (c) Bodily Injury & Property Damage
117

118 The General Liability insurance shall include the State as an
119 Additional Insured. The required limit of insurance may be provided
120 by a single policy or with a combination of primary and excess
121 policies. Refer to SPECIAL CONDITIONS for any additional
122 requirements.
123

124 **(4) Builders Risk For All Work.** The Contractor shall take out
125 a policy of builder's risk insurance for the full replacement value of
126 the project work; from a company licensed or otherwise authorized
127 to do business in the State of Hawaii; naming the State as an
128 additional insured under each policy; and covering all work, labor,
129 and materials furnished by such Contractor and all its
130 subcontractors against loss by fire, windstorm, tsunamis,
131 earthquakes, lightning, explosion, other perils covered by the
132 standard Extended Coverage Endorsement, vandalism, and
133 malicious mischief. Refer to SPECIAL CONDITIONS for any
134 additional requirements."

135 (II) Amend **Section 107.04 Overtime and Night Work** to add the following
136 after line 158:

137

138 “Contractor shall obtain applicable Noise Variance permits and submit to the
139 Engineer copies of the Noise Variance Permits with noise variance hours, control
140 conditions, and restrictions. The Engineer shall review and approve all Noise
141 Variance permit applications prior to the Contractor submitting their application”

142

143 (III) Amend Section 107.10 Furnishing Right-of-Way by adding the following
144 paragraphs after line 279:

145

146 “The State DOT is processing Right-of Entry and Rental Agreements with
147 the following property owners and the Contractor shall comply with terms of the
148 Right-of-Entry and Rental Agreements, including but not limited to, the following:

149

150 (A) D.R. Horton TMK (1) 9-1-17:194, 195, 196, 201; 9-1-18:012, 019 (portion);
151 Gagko Hojin Tokai Daigaku TMK (1) 9-1-16:221 (portion);
152 Grace Pacific TMK (1) 9-1-16:004 (portion);
153 Hawaiian Electric TMK (1) 9-1-16:182 (portion);
154 HBP Partners TMK (1) 9-1-18:016 (portion); and
155 University of Hawaii TMK (1) 9-1-16:179, 183, 220 (portion)

156

157 (1) STATE's Responsibility. The State shall be responsible, to the extent
158 permitted by law, for damage or injury caused by the State's officers and
159 employees in the scope of their employment provided that the State's
160 liability for such damage or injury has been determined by a court or
161 agreed to by the State. The State shall pay for such damage and injury
162 provided that funds are appropriate and allotted for that purpose.

163

164 (2) Insurance by CONTRACTOR. The State shall require the
165 CONTRACTOR to include the GRANTOR and the STATE as additional
166 insured on the insurance policies (Comprehensive Personal Injury and
167 Property Damage Liability; Automobile Bodily Injury and Property
168 Damage; and Worker's Compensation) that will be prescribed by the
169 proposed Project construction contract. Said insurance policies shall also
170 provide a waiver of subrogation in GRANTOR's favor. The STATE shall
171 require the CONTRACTOR to provide written verification of compliance in
172 the form of an insurance certificate to the GRANTOR prior to the start of
173 Project construction.

174

175 (3) Indemnification by CONTRACTOR. The STATE shall ensure that
176 the CONTRACTOR shall execute an agreement whereby the
177 CONTRACTOR would indemnify the GRANTOR against any liability,
178 including all loss, damages, costs, expenses and attorney's fees, for any
179 damage, if any, or injury to or death of persons when such damage,

180 injury or death is caused by negligence, gross negligence, or willful
181 action of the CONTRACTOR in the exercise of the rights granted under
182 this Agreement; provided that the CONTRACTOR shall not be obligated
183 to indemnify the GRANTOR if and to the extent that such damage, injury,
184 or death is caused by the negligence of the GRANTOR or any of the
185 GRANTOR's officers, employees, agents, licensees, invitees, contractors,
186 representatives, or guests.

187
188 (4) Restoration. Upon the full or partial termination of this Agreement, the
189 STATE and/or its contractors shall remove all equipment or tangible
190 personal property from the Property or such portion thereof not required
191 by the STATE and shall restore the ground condition of only of that portion
192 of the Property no longer required by the STATE to the condition as
193 mentioned in the STATE's offer letter to the property owners.

194
195 **(IV) Add Section 107.18 Citizen and Residential Labor Force** after line 745
196 to read as follows:

197
198 **"107.18 Citizen and Residential Labor Force.**

199
200 **(A) Citizen Labor.** No person shall be employed as a laborer or
201 mechanic unless such person is a citizen of the United States or eligible to
202 become one; provided that persons without such qualifications may be
203 employed with the approval of the Governor until persons who are citizens
204 and are competent for such services are available for hire.

205
206 **(B) Residential Labor Force.** In accordance with Act 192; SLH 2011,
207 no less than eighty (80) percent of the bidder's labor force working on the
208 contract shall be provided by Hawaii residents. This act applies to all
209 construction procurements under HRS Chapter 103D; however this act
210 does not apply to procurements for professional services under Section
211 103D-304 and small purchases under Section 103D-305. This act is also
212 applicable to any subcontract of \$50,000.00 or more in connection with
213 this contract.

214
215 Resident means a person who is physically present in the State of
216 Hawaii at the time the person claims to have established the person's
217 domicile in the State of Hawaii and shows the person's intent is to make
218 Hawaii the person's primary residence.

219
220 **(C) Percentage of workforce** shall be determined by dividing the labor
221 hours (including subcontractors) provided by residents working on the
222 project divided by the total number of hours worked by all employees of
223 the contractor in the performance of the contract. Hours worked by
224 employees within shortage trades as determined by the Department of

225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249

Labor and Industrial Relations shall not be included in the calculation of this percentage.

(D) Certification of compliance with the forgoing provisions shall be made by the contractor in the form of a written oath submitted to the Procurement Officer on a monthly basis for the duration of the contract.

(E) Sanctions for non compliance with these provisions are as follows:

(1) With respect to the General Contractor, withholding of payment on the contract until the Contractor or its Subcontractor complies with HRS Chapter 103B as amended by Act 192, SLH 2011.

(2) Proceedings for debarment or suspension of the Contractor or Subcontractor under Hawaii Revised Statutes § 103D-702.

This Section shall not apply when its application will disqualify the State from receiving federal funds or aid.”

END OF SECTION 107

1 Amend **Section 108 – PROSECUTION AND PROGRESS** to read as follows:
2

3 **“SECTION 108 – PROSECUTION AND PROGRESS**
4

5
6 **108.01 Notice to Proceed (NTP).** A Notice To Proceed will be issued to the
7 Contractor not more than 475 calendar days after the contract certification date, or
8 upon the Engineer’s confirmation of receipt of State furnished long-lead items,
9 described in the contract plans, The Engineer may suspend the contract before
10 issuing the Notice To Proceed, in which case the Contractor’s remedies are
11 exclusively those set forth in Subsection 108.10 – Suspension of Work.
12

13 The Contractor shall be allowed up to 14 calendar days after the Notice to
14 Proceed to begin physical work. The Start Work Date will be established when
15 this period ends or on the actual day that physical work begins, whichever is first.
16 Charging of Contract Time will begin on the Start Work Date. The Contractor shall
17 notify the Engineer, in writing, at least five working days before beginning physical
18 work.
19

20 In the event that the Contractor fails to start physical work within the time
21 specified, the Engineer may terminate the contract in accordance with Subsection
22 108.11 – Termination of Contract for Cause.
23

24 During the period between the Notice to Proceed and the Start Work Date
25 the Contractor should adjust work forces, equipment, schedules, and procure
26 materials and required permits, prior to beginning physical work.
27

28 Any physical work done prior to the Start Work Date will be considered
29 unauthorized work. If the Engineer does not direct that the unauthorized work be
30 removed, it shall be paid for after the Start Work Date and only if it is acceptable.
31

32 In the event that the Engineer establishes, in writing, a Start Work Date that
33 is beyond 60 calendar days from the Notice to Proceed date, the Contractor may
34 submit a claim in accordance with, Subsection 107.15 – Disputes and Claims for
35 increased labor and material costs which are directly attributable to the delay
36 beyond the first 60 calendar days after the Notice to Proceed date.
37

38 The Contractor shall notify the Engineer at least 24 hours before restarting
39 physical work after a suspension of work pursuant to Subsection 108.10 –
40 Suspension of Work.
41

42 Once physical work has begun, the Contractor shall work expeditiously and
43 pursue the work diligently to completion with the contract time. If a portion of the
44 work is to be done in stages, the Contractor shall leave the area safe and usable
45 for the user agency and the public at the end of each stage.
46

47 **108.02 Prosecution of Work.** Unless otherwise permitted by the Engineer, in
48 writing, the Contractor shall not commence with physical construction unless
49 sufficient materials and equipment are available for either continuous construction
50 or completion of a specified portion of the work.

51
52 **108.03 Preconstruction Submittals.** The awardee shall submit to the
53 Engineer for information and review the pre-construction submittals within 21
54 calendar days from award. Until the items listed below are received and found
55 acceptable by the Engineer, the Contractor shall not start physical work unless
56 otherwise authorized to do so in writing and subject to such conditions set by the
57 Engineer. Charging of Contract Time will not be delayed, and additional contract
58 time will not be granted due to Contractor delay in submitting acceptable
59 preconstruction submittals. No progress payment will be made to the Contractor
60 until the Engineer acknowledges, in writing, receipt of the following
61 preconstruction submittals acceptable to the Engineer:

- 62
- 63 (1) List of the Superintendent and other Supervisory Personnel, and
64 their contact information.
 - 65
 - 66 (2) Name of person(s) authorized to sign for the Contractor.
67
 - 68 (3) Work Schedule including hours of operation.
69
 - 70 (4) Initial Progress Schedule (See Subsection 108.06 – Progress
71 Schedule).
 - 72
 - 73 (5) Water Pollution and Siltation Control Submittals, including Site-
74 Specific Best Management Practice Plan.
 - 75
 - 76 (6) Solid Waste Disposal form.
77
 - 78 (7) Tax Rates.
79
 - 80 (8) Insurance Rates.
81
 - 82 (9) Certificate of Insurance, satisfactory to the Engineer, indicating that
83 the Contractor has in place all insurance coverage required by the contract
84 documents.
85
 - 86 (10) Schedule of agreed prices.
87
 - 88 (11) List of suppliers.
89
 - 90 (12) Traffic Control Plan, if applicable.

91 **108.04 Character and Proficiency of Workers.** The Contractor shall at all
92 times provide adequate supervision and sufficient labor and equipment for
93 prosecuting the work to full completion in the manner and within the time required
94 by the contract. The superintendent and all other representatives of the
95 Contractor shall act in a civil and honest manner in all dealings with the Engineer,
96 all other State officials and representatives, and the public, in connection with the
97 work.

98
99 All workers shall possess the proper license, certification, job classification,
100 skill, training, and experience necessary to properly perform the work assigned to
101 them.

102
103 The Engineer may direct the removal of any worker(s) who does not carry
104 out the assigned work in a proper and skillful manner or who is disrespectful,
105 intemperate, violent, or disorderly. The worker shall be removed forthwith by the
106 Contractor and will not work again without the written permission of the Engineer.

107
108 **108.05 Contract Time.**

109
110 **(A) Calculation of Contract Time.** When the contract time is on a
111 working day basis, the total contract time allowed for the performance of
112 the work will be the number of working days shown in the contract plus any
113 additional working days authorized in writing as provided hereinafter. The
114 count of elapsed working days to be charged against contract time, will
115 begin from the Start Work Date and will continue consecutively to the date
116 of Substantial Completion. When multiple shifts are used to perform the
117 work, the State will not consider the hours worked over the normal eight
118 working hours per day or night as an additional working day.

119
120 When the contract is on a calendar day basis, the total contract time
121 allowed for the performance of the work will be the number of days shown
122 in the contract plus any additional days authorized in writing as provided
123 hereinafter. The count of elapsed days to be charged against contract time
124 will begin from the Start Work Date and will continue consecutively to the
125 date of Substantial Completion. The Engineer will exclude days elapsing
126 between the orders of the Engineer to suspend work and resume work for
127 suspensions not the fault of the Contractor.

128
129 **(B) Modifications of Contract Time.** Whenever the Contractor
130 believes that an extension of contract time is justified, the Contractor shall
131 serve written notice on the Engineer not more than five working days after
132 the occurrence of the event that causes a delay or justifies a contract time
133 extension. Contract time may be adjusted for the following reasons or
134 events, but only if and to the extent the critical path has been affected:

136 **(1) Changes in the Work, Additional Work, and Delays**
137 **Caused by the State.** If the Contractor believes that an extension of
138 time is justified on account of any act or omission by the State, and is
139 not adequately provided for in a field order or change order, it must
140 request the additional time as provided above. At the request of the
141 Engineer, the Contractor must show how the critical path will be
142 affected and must also support the time extension request with
143 schedules, as well as statements from its subcontractors, suppliers,
144 or manufacturers, as necessary. Claims for compensation for any
145 altered or additional work will be determined pursuant to Subsection
146 104.02 – Changes.

147
148 Additional time to perform the extra work will be added to the
149 time allowed in the contract without regard to the date the change
150 directive was issued, even if the contract completion date has
151 passed. A change requiring time issued after contract time has
152 expired will not constitute an excusal or waiver of pre-existing
153 Contractor delay.

154
155 **(2) Delay for Permits.** For delays in the routine application and
156 processing time required to obtain necessary permits, including
157 permits to be obtained from State agencies, the Engineer may grant
158 an extension provided that the permit takes longer than 30 days to
159 acquire and the delay is not caused by the Contractor, and provided
160 that as soon as the delay occurs, the Contractor notifies the
161 Engineer in writing that the permits are not available. Permits
162 required by the contract that take less than 30 days to acquire from
163 the time which the appropriate documents are granted shall be
164 acquired between Notice to Proceed and Start Work Date or
165 accounted for in the contractor's progress schedule. Time
166 extensions will be the exclusive relief granted on account of such
167 delays.

168
169 **(3) Delays Beyond Contractor's Control.** For delays caused by
170 acts of God, a public enemy, fire, inclement weather days or
171 adverse conditions resulting therefrom, earthquakes, floods,
172 epidemics, quarantine restrictions, labor disputes impacting the
173 Contractor or the State, freight embargoes and other reasons
174 beyond the Contractor's control, the Contractor may be granted an
175 extension of time provided that:

176
177 **(a)** In the written notice of delay to the Engineer, the
178 Contractor describes possible effects on the completion date
179 of the contract. The description of delays shall:
180

181
182
183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199
200
201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224

1. State specifically the reason or reasons for the delay and fully explain in a detailed chronology how the delay affects the critical path.
2. Include copies of pertinent documentation to support the time extension request.
3. Cite the anticipated period of delay and the time extension requested.
4. State either that the above circumstances have been cleared and normal working conditions restored as of a certain day or that the above circumstances will continue to prevent completion of the project.

(b) The Contractor shall notify the Engineer in writing when the delay ends. Time extensions will be the exclusive relief granted and no additional compensation will be paid the Contractor for such delays.

(4) Delays in Delivery of Materials or Equipment. Due to COVID 19 and other supply chain issues, the Contractor shall anticipate delays into the project schedule at the time of bidding. Delay costs proven not anticipated at the time of bidding may be considered additional costs. For delays in delivery of materials or equipment, which occur as a result of unforeseeable causes beyond the control and without fault of the Contractor, its subcontractor(s) or supplier(s), time extensions shall be the exclusive relief granted and no additional compensation will be paid the Contractor on account of such delay. The delay shall not exceed the difference between the originally scheduled delivery date and the actual delivery date. The Contractor may be granted an extension of time provided that it complies with the following procedures:

(a) The Contractor’s written notice to the Engineer must describe the delays and state the effect such delays may have on the critical path.

(b) The Contractor, if requested, must submit to the Engineer within five days after a firm delivery date for the material and equipment is established, a written statement regarding the delay. The Contractor must justify the delay as follows:

225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269

1. State specifically all reasons for the delay. Explain in a detailed chronology the effect of the delay on the critical path.
2. Submit copies of purchase order(s), factory invoice(s), bill(s) of lading, shipping manifest(s), delivery tag(s), and any other documents to support the time extension request.
3. Cite the start and end date of the delay and the time extension requested.

(5) Delays for Suspension of Work. When the performance of the work is totally suspended for one or more days (calendar or working days, as appropriate) by order of the Engineer in accordance with Subsections 108.10(A)(1), 108.10(A)(2), or 108.10(A)(5) the number of days from the effective date of the Engineer's order to suspend operations to the effective date of the Engineer's order to resume operations shall not be counted as contract time and the contract completion date will be adjusted. During periods of partial suspensions of the work, the Contractor will be granted a time extension only if the partial suspension affects the critical path. If the Contractor believes that an extension of time is justified for a partial suspension of work, it must request the extension in writing at least five working days before the partial suspension will affect the critical operation(s) in progress. The Contractor must show how the critical path was increased based on the status of the work and must also support its claim if requested, with statements from its subcontractors. A suspension of work will not constitute a waiver of pre-existing Contractor delay.

(6) Contractor Caused Delays. No time extension will be granted under the following circumstances:

- (a) Delays within the Contractor's control in performing the work caused by the Contractor, subcontractor, supplier, or any combination thereof.
- (b) Delays within the Contractor's control in arrival of materials and equipment caused by the Contractor, subcontractor, supplier, or any combination thereof, in ordering, fabricating, and delivery.
- (c) Delays requested for changes which do not affect the critical path.

270 (d) Delays caused by the failure of the Contractor to make
271 submittals in a timely manner for review and acceptance by
272 the Engineer, such as but not limited to shop drawings,
273 descriptive sheets, material samples, and color samples
274 except as covered in Subsection 108.05(B)(3) – Delays
275 Beyond Contractor’s Control and 108.05(B)(4) – Delays in
276 Delivery of Materials or Equipment.

277
278 (e) Delays caused by the failure to submit sufficient
279 information and data in a timely manner in the proper form in
280 order to obtain necessary permits related to the work.

281
282 (f) Failure to follow the procedure within the time allowed
283 by contract to request a time extension.

284
285 (g) Failure of the Contractor to provide evidence sufficient
286 to support the time extension request.

287
288 (7) **Reduction in Time.** If the State deletes or modifies any
289 portion of the work, an appropriate reduction of contract time may be
290 made in accordance with Subsection 104.02 - Changes.

291
292 **108.06 Progress Schedules.**

293
294 (A) **Forms of Schedule.** All schedules shall be submitted using the
295 specific computer program designated in the bid documents. If no such
296 scheduling software program is designated, then all schedules shall be
297 submitted using the latest version of Microsoft Project by Microsoft or
298 approved equivalent software program.

299
300 Schedule submittals shall be as follows:

301
302 (1) **For Contracts \$2,000,000 or less or For Contract Time 100**
303 **Working Days or 140 Calendar Days or Less.** For contracts of
304 \$2,000,000 or less or for contract time of 100 working days or 140
305 calendar days or less, the progress schedule will be a Time Scaled
306 Logic Diagram (TSLD). The Contractor shall submit a TSLD
307 submittal package meeting the following requirements and having
308 these essential and distinctive elements:

309
310 (a) The major features of work, such as but not limited to
311 BMP installation, grubbing, roadway excavation, structure
312 excavation, structure construction, shown in the chronological
313 order in which the Contractor proposes to work that feature or
314 work and its location on the project. The schedule shall
315 account for normal inclement weather, unusual soil or other

316
317
318
319
320
321
322
323
324
325
326
327
328
329
330
331
332
333
334
335
336
337
338
339
340
341
342
343
344
345
346
347
348
349
350
351
352
353
354
355
356
357
358
359
360
361
362

conditions that may influence the progress of the work, schedules, and coordination required by any utility, off or on site fabrications, and other pertinent factors that relate to progress;

(b) All features listed or not listed in the contract documents that the Contractor considers a controlling factor for the timely completion of the contract work.

(c) The time span and sequence of the activities or events for each feature, and its interrelationship and interdependencies in time and logic to other features in order to complete the project.

(d) The total anticipated time necessary to complete work required by the contract.

(e) A chronological listing of critical intermediate dates or time periods for features or milestones or phases that can affect timely completion of the project.

(f) Major activities related to the location on the project.

(g) Non-construction activities, such as submittal and acceptance periods for shop drawings and material, procurement, testing, fabrication, mobilization, and demobilization or order dates of long lead material.

(h) Set schedule logic for out of sequence activities to retain logic. In addition, open ends shall be non-critical.

(i) Show target bars for all activities.

(j) Vertical and horizontal sight lines both major and minor shall be used as well as a separator line between groups. The Engineer will determine frequency and style.

(k) The file name, print date, revision number, data and project title and number shall be included in the title block.

(l) Have columns with the appropriate data in them for activity ID, description, original duration, remaining duration, early start, early finish, total float, percent complete, resources. The resource column shall list who is responsible for the work to be done in the activity. These columns shall be to the left of the bar chart.

363 **(2) For Contracts Which Have A Contract Amount More Than**
364 **\$2,000,000 Or Having A Contract Time Of More Than 100**
365 **Working Days Or 140 Calendar Days.** For contracts which have a
366 contract amount more than \$2,000,000 or contract time of more than
367 100 working days or 140 calendar days, the Contractor shall submit
368 a Timed-Scaled Logic Diagram (TSLD) meeting the following
369 requirements and having these essential and distinctive elements:

370
371 **(a)** The information and requirements listed in Subsection
372 108.06(A)(1) – For Contracts \$2,000,000 or Less or For
373 Contract Time 100 Working Days or 140 Calendar Days or
374 Less.

375
376 **(b)** Additional reports and graphics available from the
377 software as requested by the Engineer.

378
379 **(c)** Sufficient detail to allow at least weekly monitoring of
380 the Contractor and subcontractor's operations.

381
382 **(d)** The time scaled schematic shall be on a calendar or
383 working days basis. What will be used shall be determined by
384 how the contract keeps track of time. It will be the same. Plot
385 the critical calendar dates anticipated.

386
387 **(e)** Breakdown of activity, such as forming, placing
388 reinforcing steel, concrete pouring and curing, and stripping
389 in concrete construction. Indicate location of work to be done
390 in such detail that it would be easily determined where work
391 would be occurring within approximately 200 feet.

392
393 **(f)** Latest start and finish dates for critical path activities.

394
395 **(g)** Identify responsible subcontractor, supplier, and others
396 for their respective activity.

397
398 **(h)** No individual activity shall have duration of more than
399 20 calendar days unless requested and approved by the
400 Engineer.

401
402 **(i)** All activities shall have work breakdown structure
403 codes and activity codes. The activity codes shall have
404 coding that incorporates information for phase, location, who
405 is responsible for doing work and type of operation and
406 activity description.

408 (j) Incorporate all physical access and availability
409 restraints.

410
411 **(B) Inspection and Testing.** All schedules shall provide reasonable
412 time and opportunity for the Engineer to inspect and test each work activity.
413

414 **(C) Engineer's Acceptance of Progress Schedule.** The submittal of,
415 and the Engineer's receipt of any progress schedule, shall not be deemed
416 an agreement to modify any terms or conditions of the contract. Any
417 modifications to the contract terms and conditions that appear in or may be
418 inferred from an acceptable schedule will not be valid or enforceable unless
419 and until the Engineer exercises discretion to issue an appropriate change
420 order. Nor shall any submittal or receipt imply the Engineer's approval of
421 the schedule's breakdown, its individual elements, any critical path that may
422 be shown, nor shall it obligate the State to make its personnel available
423 outside normal working hours or the working hours established by the
424 Contract in order to accommodate such schedule. The Contractor has the
425 risk of all elements (whether or not shown) of the schedule and its
426 execution. No claim for additional compensation, time, or both, shall be
427 made by the Contractor or recognized by the Engineer for delays during
428 any period for which an acceptable progress schedule or an updated
429 progress schedule as required by Subsection 108.06(E) – Contractor's
430 Continuing Schedule Submittal Requirements had not been submitted. Any
431 acceptance or approval of the schedule shall be for general format only and
432 shall not be deemed an agreement by the State that the construction
433 means, methods, and resources shown on the schedule will result in work
434 that conforms to the contract requirements or that the sequences or
435 durations indicated are feasible.
436

437 **(D) Initial Progress Schedule.** The Contractor shall submit an initial
438 progress schedule. The initial progress schedule shall consist of the
439 following:
440

- 441 (1) Four sets of the TSLD schedule.
- 442
- 443 (2) All the software files and data to re-create the TSLD in a
444 computerized software format as specified by the Engineer.
445
- 446 (3) A listing of equipment that is anticipated to be used on the
447 project. Including the type, size, make, year of manufacture, and all
448 information necessary to identify the equipment in the Rental Rate
449 Blue Book for Construction Equipment.
450
- 451 (4) An anticipated manpower requirement graph plotting contract
452 time and total manpower requirement. This may be superimposed
453 over the payment graph.
454

455 (5) A Method Statement that is a detailed narrative describing the
456 work to be done and the method by which the work shall be
457 accomplished for each major activity. A major activity is an activity
458 that has one or more of the following:

- 459 (a) Has a duration longer than five days.
- 460 (b) Is a milestone activity.
- 461 (c) Is a contract item that exceeds \$10,000 on the contract
462 cost proposal.
- 463 (d) Is a critical path activity.
- 464 (e) Is an activity designated as such by the Engineer.

465 Each Method Statement shall include the following items
466 needed to fulfill the schedule:

- 467 (a) Quantity, type, make, and model of equipment.
- 468 (b) The manpower to do the work, specifying worker
469 classification.
- 470 (c) The production rate per eight hour day, or the working
471 hours established by the contract documents needed to meet
472 the time indicated on the schedule. If the production rate is
473 not for eight hours, the number of working hours shall be
474 indicated.

475 (6) Two sets of color time-scaled project evaluation and review
476 technique charts ("PERT") using the activity box template of Logic –
477 Early Start or such other template designated by the Engineer.

478 If the contract documents establish a sequence or order for the work,
479 the initial progress schedule shall conform to such sequence or order.

480 **(E) Contractor's Continuing Schedule Submittal Requirements.**

481 After the acceptance of the initial TSLD and when construction starts, the
482 Contractor shall submit four plotted progress schedules, two PERT charts,
483 and reports on all construction activities every two weeks (bi-weekly). This
484 scheduled bi-weekly submittal shall also include an updated version of the
485 project schedule in a computerized software format as specified by the
486 Engineer. The submittal shall have all the information needed to re-create
487 that time period's TSLD plot and reports. The bi-weekly submittal shall
488 include, but not limited to, an update of activities based on actual durations,
489
490
491
492
493
494
495
496
497
498
499
500

501 all new activities and any changes in duration or start or finish dates of any
502 activity.

503
504 The Contractor shall submit with every update, in report form
505 acceptable to the Engineer, a list of changes to the progress schedule since
506 the previous schedule submittal. The Engineer may change the frequency
507 of the submittal requirements but may not require a submittal of the
508 schedule to be more than once a week. The Engineer may decrease the
509 frequency of the submittal of the bi-weekly schedule.

510
511 The Contractor shall submit updates of the anticipated work
512 completion graph, equipment listing, manpower requirement graph or
513 method statement when requested by the Engineer. The Contractor shall
514 submit such updates within 4 calendar days from the date of the request by
515 the Engineer.

516
517 The Engineer may withhold progress payment until the Contractor is
518 in compliance with all schedule update requirements

519
520 **(F) Float.** All float appearing on a schedule is a shared commodity.
521 Float does not belong to or exist for the exclusive use or benefit of either
522 the State or the Contractor. The State or the Contractor has the opportunity
523 to use available float until it is depleted. Float has no monetary value.

524
525 **(G) Scheduled Meetings.** The Contractor shall meet on a bi-weekly
526 basis with the Engineer to review the progress schedule. The Contractor
527 shall have someone attending the meeting that can answer all questions on
528 the TSLD and other schedule related submittals.

529
530 **(H) Accelerated Schedule; Early Completion.** If the Contractor
531 submits an accelerated schedule (shorter than the contract time), the
532 Engineer's review and acceptance of an accelerated schedule does not
533 constitute an agreement or obligation by the State to modify the contract
534 time or completion date. The Contractor is solely responsible for and shall
535 accept all risks and any delays, other than those that can be directly and
536 solely attributable to the State, that may occur during the work, until the
537 contract completion date. The contract time or completion date is
538 established for the benefit of the State and cannot be changed without an
539 appropriate change order or Substantial Completion granted by the State.
540 The State may accept the work before the completion date is established,
541 but is not obligated to do so.

542 If the TSLD indicates an early completion of the project, the
543 Contractor shall, upon submittal of the schedule, cooperate with the
544 Engineer in explaining how it will be achieved. In addition, the Contractor
545 shall submit the above explanation in writing which shall include the State's
546 part, if any, in achieving the early completion date. Early completion of the
547 project shall not rely on changes to the Contract Documents unless
548 approved by the Engineer.

549
550 **(I) Contractor Responsibilities.** The Contractor shall promptly
551 respond to any inquiries from the Engineer regarding any schedule
552 submission. The Contractor shall adjust the schedule to address directives
553 from the Engineer and shall resubmit the TSLD package to the Engineer
554 until the Engineer finds it acceptable.
555

556 The Contractor shall perform the work in accordance with the
557 submitted TSLD. The Engineer may require the Contractor to provide
558 additional work forces and equipment to bring the progress of the work into
559 conformance with the TSLD at no increase in contract price or contract time
560 whenever the Engineer determines that the progress of the work does not
561 insure completion within the specified contract time.
562

563 **108.07 Weekly Meeting.** In addition to the bi-weekly schedule meetings, the
564 Contractor shall be available to meet once a week with the Engineer at the time
565 and place as determined by the Engineer to discuss the work and its progress
566 including but not limited to, the progress of the project, potential problems,
567 coordination of work, submittals, erosion control reports, etc. The Contractor's
568 personnel attending shall have the authority to make decisions and answer
569 questions.
570

571 The Contractor shall bring to weekly meetings a detailed work schedule
572 showing the next three weeks' work. Directly submit an informational copy of the
573 three-week schedule to the Material Testing Research Branch (MTRB) on the
574 same day as the weekly meeting is held or was to be held. An informational copy
575 is for informational use only and requires no response or further action from the
576 MTRB. Number of copies of the detailed work schedule to be submitted will be
577 determined by the Engineer. The three-week schedule is in addition to the TSLD
578 and shall in no way be considered as a substitute for the TSLD or vice versa. The
579 three-week schedule shall show:
580

581 **(a)** All construction events, traffic control and BMP related activities in
582 such detail that the Engineer will be able to determine at what location and
583 type of work will be done for any day for the next three weeks. This is for
584 the State to use to plan its manpower requirements for that time period.
585

586 **(b)** The duration of all events and delays.
587

588 (c) The critical path clearly marked in red or marked in a manner that
589 makes it clearly distinguishable from other paths and is acceptable to the
590 Engineer.

591
592 (d) Critical submittals and requests for information (RFI's).

593
594 (e) The project title, project number, date created, period the schedule
595 covers, Contractor's name and creator of the schedule on each page.

596
597 Two days prior to each weekly meeting, the Contractor shall submit
598 a list of outstanding submittals, RFIs and issues that require discussion.
599

600 **108.08 Liquidated Damages for Failure to Complete the Work or Portions**
601 **of the Work on Time.** The actual amount of damages resulting from the
602 Contractor's failure to complete the contract in a timely manner is difficult to
603 accurately determine. Therefore, the amount of such damages shall be liquidated
604 damages as set forth herein and in the special provisions. The State may, at its
605 discretion, deduct the amount from monies due or that may become due under the
606 contract.

607
608 When the Contractor fails to reach substantial completion of the work for
609 which liquidated damages are specified, within the time or times fixed in the
610 contract or any extension thereof, in addition to all other remedies for breach that
611 may be available to the State, the Contractor shall pay liquidated damages to the
612 State, in the amount of \$35,000 per working day.

613
614 (A) **Liquidated Damages Upon Termination.** If the State terminates
615 on account of Contractor's default, liquidated damages may be charged
616 against the defaulting Contractor and its surety until final completion of
617 work.

618
619 (B) **Liquidated Damages for Failure to Complete the Punchlist.** The
620 Contractor shall complete the work on any punchlist created after the pre-
621 final inspection, within the contract time or any extension thereof.

622
623 When the Contractor fails to complete the work on such punchlist
624 within the contract time or any extension thereof, the Contractor shall pay
625 liquidated damages to the State of 20 percent of the amount of liquidated
626 damages established for failure to substantially complete the work within
627 contract time. Liquidated damages shall not be assessed for the period
628 between:

629
630 (1) Notice from the Contractor that the project is substantially
631 complete and the time the punchlist is delivered to the Contractor.
632

633 (2) The date of the completion of punchlist as determined by the
634 Engineer and the date of the successful final inspection, and

635
636 (3) The date of the Final Inspection that results in Substantial
637 Completion and the receipt by the Contractor of the written notice of
638 Substantial Completion.

639
640 (C) **Actual Damages Recoverable If Liquidated Damages Deemed**
641 **Unenforceable.** In the event a court of competent jurisdiction holds that
642 any liquidated damages assessed pursuant to this contract are
643 unenforceable, the State will be entitled to recover its actual damages for
644 Contractor's failure to complete the work, or any designated portion of the
645 work within the time set by the contract.

646
647 **108.09 Rental Fees for Unauthorized Lane Closure or Occupancy.** In
648 addition to all other remedies available to the State for Contractor's breach of the
649 terms of the contract, the Engineer will assess the rental fees in the amount of
650 \$500 for every one-to fifteen-minute increment or portion thereof, for each location,
651 for each roadway lane closed to public use or encroached upon or occupied
652 beyond the time periods authorized in the contract or by the Engineer. The State
653 may, at its discretion, deduct the amount from monies due or that may become
654 due under the contract. The rental fee may be waived in whole or part if the
655 Engineer determines that the unauthorized period of lane closure or occupancy
656 was due to factors beyond the control of the Contractor. Equipment breakdown is
657 not a cause to waive liquidated damages.

658
659 **108.10 Suspension of Work.**

660
661 (A) **Suspension of Work.** The Engineer may, by written order, suspend
662 the performance of the work, either in whole or in part, for such periods as
663 the Engineer may deem necessary, for any cause, including but not limited
664 to:

665
666 (1) Weather or soil conditions considered unsuitable for
667 prosecution of the work.

668
669 (2) Whenever a redesign that may affect the work is deemed
670 necessary by the Engineer.

671
672 (3) Unacceptable noise or dust arising from the construction even
673 if it does not violate any law or regulation.

674
675 (4) Failure on the part of the Contractor to:

676
677 (a) Correct conditions unsafe for the general public or for
678 the workers.

679
680
681
682
683
684
685
686
687
688
689
690
691
692
693
694
695
696
697
698
699
700
701
702
703
704
705
706
707
708
709
710
711
712
713
714
715
716
717
718
719
720
721
722
723

(b) Carry out orders given by the Engineer.

(c) Perform the work in strict compliance with the provisions of the contract.

(d) Provide adequate supervision on the jobsite.

(5) The convenience of the State.

(B) Partial and Total Suspension. Suspension of work on some but not all items of work shall be considered a “partial suspension”. Suspension of work on all items shall be considered “total suspension”. The period of suspension shall be computed from the date set out in the written order for work to cease until the date of the order for work to resume.

(C) Reimbursement to Contractor. In the event that the Contractor is ordered by the Engineer in writing as provided herein to suspend all work under the contract for the reasons specified in Subsections 108.10(A)(2), 108.10(A)(3), or 108.10(A)(5) of the “Suspension of Work” paragraph, the Contractor may be reimbursed for actual direct costs incurred on work at the jobsite, as authorized in writing by the Engineer, including costs expended for the protection of the work. An allowance of 5 percent for indirect categories of delay costs will be paid on any reimbursed direct costs, including extended branch and home-office overhead and delay impact costs. No allowance will be made for anticipated profits. Payment for equipment which is ordered to standby during such suspension of work shall be made as described in Subsection 109.06(H) - Idle and Standby Equipment.

(D) Cost Adjustment. If the performance of all or part of the work is suspended for reasons beyond the control of the Contractor except an adjustment shall be made for any increase in cost of performance of this contract (excluding profit) necessarily caused by such suspension, and the contract modified in writing accordingly.

However, no adjustment to the contract price shall be made for any suspension, delay, or interruption:

(1) For weather related conditions.

(2) To the extent that performance would have been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the Contractor.

724 (3) Or, for which an adjustment is provided for or excluded under
725 any other provision of this Contract.
726

727 **(E) Claims for Adjustment.** Any adjustment in contra price made shall
728 be determined in accordance with Subsections 104.02 – Changes and
729 104.06 – Methods of Price Adjustment.
730

731 Any claims for such compensation shall be filed in writing with the
732 Engineer within 30 days after the date of the order to resume work or the
733 claim will not be considered. The claim shall conform to the requirements
734 of Subsection 107.15(D) – Making of a Claim. The Engineer will take the
735 claim under consideration, may make such investigations as are deemed
736 necessary and will be the sole judge as to the equitability of the claim. The
737 Engineer’s decision will be final.
738

739 **(F) No Adjustment.** No provision of this clause shall entitle the
740 Contractor to any adjustments for delays due to failure of its surety, the
741 cancellation or expiration of any insurance coverage required by the
742 contract documents, for suspensions made at the request of the Contractor,
743 for any delay required under the contract, for suspensions, either partial or
744 whole, made by the Engineer under Subsection 108.10(A)(4) of the
745 “Suspension of work” paragraph.
746

747 **108.11 Termination of Contract for Cause.**
748

749 **(A) Default.** If the Contractor refuses or fails to perform the work, or any
750 separable part thereof, with such diligence as will assure its completion
751 within the time specified in this contract, or any extension thereof, or
752 commits any other material breach of this contract, and further fails within
753 seven days after receipt of written notice from the Engineer to commence
754 and continue correction of the refusal or failure with diligence and
755 promptness, the Engineer may, by written notice to the Contractor, declare
756 the Contractor in breach and terminate the Contractor’s right to proceed
757 with the work or the part of the work as to which there has been delay or
758 other breach of contract. In such event, the State may take over the work,
759 perform the same to completion, by contract or otherwise, and may take
760 possession of, and utilize in completing the work, the materials, appliances,
761 and plants as may be on the site of the work and necessary therefore.
762 Whether or not the Contractor’s right to proceed with the work is terminated,
763 the Contractor and the Contractor’s sureties shall be liable for any damage
764 to the State resulting from the Contractor’s refusal or failure to complete the
765 work within the specified time.
766

767 **(B) Additional Rights and Remedies.** The rights and remedies of the
768 State provided in this contract are in addition to any other rights and
769 remedies provided by law.

770
771
772
773
774
775
776
777
778
779
780
781
782
783
784
785
786
787
788
789
790
791
792
793
794
795
796
797
798
799
800
801
802
803
804
805
806
807
808
809
810
811
812
813

(C) Costs and Charges. All costs and charges incurred by the State, together with the cost of completing the work under contract, will be deducted from any monies due or which would or might have become due to the Contractor had it been allowed to complete the work under the contract. If such expense exceeds the sum which would have been payable under the contract, then the Contractor and the surety shall be liable and shall pay the State the amount of the excess.

In case of termination, the Engineer will limit any payment to the Contractor to the part of the contract satisfactorily completed at the time of termination. Payment will not be made until the work has satisfactorily been completed and all required documents, including the tax clearance required by Subsection 109.11 – Final Payment are submitted by the Contractor. Termination shall not relieve the Contractor or Surety from liability for liquidated damages.

(D) Erroneous Termination for Cause. If, after notice of termination of the Contractor's right to proceed under this section, it is determined for any reason that good cause did not exist to allow the State to terminate as provided herein, the rights and obligations of the parties shall be the same as, and the relief afforded the Contractor shall be limited to, the provisions contained in Subsection 108.12 – Termination for Convenience.

108.12 Termination For Convenience.

(A) Terminations. The Director may, when the interests of the State so require, terminate this contract in whole or in part, for the convenience of the State. The Director will give written notice of the termination to the Contractor specifying the part of the contract terminated and when termination becomes effective.

(B) Contractor's Obligations. The Contractor shall incur no further obligations in connection with the terminated work and on the date set in the notice of termination the Contractor shall stop work to the extent specified. The Contractor shall also terminate outstanding orders and subcontracts as they relate to the terminated work. The Contractor shall settle the liabilities and claims arising out of the termination of subcontracts and orders connected with the terminated work subject to the State's approval. The Engineer may direct the Contractor to assign the Contractor's right, title, and interest under terminated orders or subcontracts to the State. The Contractor must still complete the work not terminated by the notice of termination and may incur obligations as necessary to do so.

814 **(C) Right to Construction and Goods.** The Engineer may require the
815 Contractor to transfer title and to deliver to the State in the manner and to
816 the extent directed by the Engineer, the following:

817
818 (1) Any completed work.

819
820 (2) Any partially completed construction, goods, materials, parts,
821 tools, dies, jigs, fixtures, drawings, information, and contract rights
822 (hereinafter called "construction material") that the Contractor has
823 specifically produced or specially acquired for the performance of the
824 terminated part of this contract.

825
826 (3) The Contractor shall protect and preserve all property in the
827 possession of the Contractor in which the State has an interest. If
828 the Engineer does not elect to retain any such property, the
829 Contractor shall use its best efforts to sell such property and
830 construction materials for the State's account in accordance with the
831 standards of HRS Chapter 490:2-706.

832
833 **(D) Compensation.**

834
835 (1) The Contractor shall submit a termination claim specifying the
836 amounts due because of the termination for convenience together
837 with cost or pricing data, submitted to the extent required by HAR
838 Subchapter 15, Chapter 3-122. If the Contractor fails to file a
839 termination claim within one year from the effective date of
840 termination, the Engineer may pay the Contractor, if at all, an amount
841 set in accordance with Subsection 108.12(D)(3).

842
843 (2) The Engineer and the Contractor may agree to a settlement
844 provided the Contractor has filed a termination claim supported by
845 cost or pricing data submitted as required and that the settlement
846 does not exceed the total contract price plus settlement costs
847 reduced by payments previously made by the State, the proceeds of
848 any sales of construction, supplies, and construction materials under
849 Subsection 108.12(C)(3), and the proportionate contract price of the
850 work not terminated.

851
852 (3) Absent complete agreement, the Engineer will pay the
853 Contractor the following amounts less any payments previously
854 made under the contract:

855
856 (a) The cost of all contract work performed prior to the
857 effective date of the notice of termination work plus a 5
858 percent markup on the actual direct costs, including amounts
859 paid to subcontractor, less amounts paid or to be paid for

860
861
862
863
864
865
866
867
868
869
870
871
872
873
874
875
876
877
878
879
880
881
882
883
884
885
886
887
888
889
890
891
892
893
894
895
896
897
898
899
900
901
902
903
904
905

completed portions of such work; provided, however, that if it appears that the Contractor would have sustained a loss if the entire contract would have been completed, no markup shall be allowed or included and the amount of compensation shall be reduced to reflect the anticipated rate of loss. No anticipated profit or consequential damage will be due or paid.

(b) Subcontractors shall be paid a markup of 10 percent on their direct job costs incurred to the date of termination. No anticipated profit or consequential damage will be due or paid to any subcontractor. These costs must not include payments made to the Contractor for subcontract work during the contract period.

(c) The total sum to be paid the Contractor shall not exceed the total contract price reduced by the amount of any sales of construction supplies, and construction materials.

(4) Cost claimed, agreed to, or established by the State shall be in accordance with HAR Chapter 3-123.

108.13 Pre-Final and Final Inspections.

(A) Inspection Requirements. Before the Engineer undertakes a final inspection of any work, a pre-final inspection must first be conducted. The Contractor shall notify the Engineer that the work has reached substantial completion and is ready for pre-final inspection.

(B) Pre-Final Inspection. Before notifying the Engineer that the work has reached substantial completion, the Contractor shall inspect the project and test all installed items with all of its subcontractors as appropriate. The Contractor shall also submit the following documents as applicable to the work:

- (1)** All written guarantees required by the contract.
- (2)** Two accepted final field-posted drawings as specified in Section 648 – Field-Posted Drawings;
- (3)** Complete weekly certified payroll records for the Contractor and Subcontractors.
- (4)** Certificate of Plumbing and Electrical Inspection.
- (5)** Certificate of building occupancy as required.

- 906 (6) Certificate of Soil and Wood Treatments.
907
908 (7) Certificate of Water System Chlorination.
909
910 (8) Certificate of Elevator Inspection, Boiler and Pressure Pipe
911 Inspection.
912
913 (9) Maintenance Service Contract and two copies of a list of all
914 equipment installed.
915
916 (10) Current Tax clearance. The contractor will be required to
917 submit an additional tax clearance certificate when the final payment
918 is made.
919
920 (11) And any other final items and submittals required by the
921 contract documents.

922
923 **(C) Procedure.** When in compliance with the above requirements, the
924 Contractor shall notify the Engineer in writing that the project has reached
925 substantial completion and is ready for pre-final inspection.
926

927 The Engineer will then make a preliminary determination as to
928 whether or not the project is substantially complete and ready for pre-final
929 inspection. The Engineer may, in writing, postpone until after the pre-final
930 inspection the Contractor's submittal of any of the items listed in Subsection
931 108.13(B) – Pre-Final Inspection, herein, if in the Engineer's discretion it is
932 in the interest of the State to do so.
933

934 If, in the opinion of the Engineer, the project is not substantially
935 complete, the Engineer will provide the Contractor a punchlist of specific
936 deficiencies in writing which must be corrected or finished before the work
937 will be ready for a pre-final inspection. The Engineer may add to or
938 otherwise modify this punchlist from time to time. The Contractor shall take
939 immediate action to correct the deficiencies and must repeat all steps
940 described above including written notification that the work is ready for pre-
941 final inspection.
942

943 After the Engineer is satisfied that the project appears substantially
944 complete a final inspection shall be scheduled within ten working days after
945 receipt of the Contractor's latest letter of notification that the project is ready
946 for final inspection.
947

948 If, as a result of the pre-final inspection, the Engineer determines the
949 work is not substantially complete, the Engineer will inform the Contractor in
950 writing as to specific deficiencies which must be corrected before the work
951 will be ready for another pre-final inspection. If the Engineer finds the work

952 is substantially complete but finds deficiencies that must be corrected
953 before the work is ready for final inspection, the Engineer will prepare in
954 writing and deliver to the Contractor a punchlist describing such
955 deficiencies. At any time before final acceptance, the Engineer may revoke
956 the determination of substantial completion if the Engineer finds that it was
957 not warranted and will notify the Contractor in writing the reasons therefore
958 together with a description of the deficiencies negating the declaration.
959

960 When the date of substantial completion has been determined by the
961 State, liquidated damages for the failure to complete the punchlist, if due to
962 the State will be assessed in pursuant to Subsection 108.08(B) - Liquidated
963 Damages for Failure to Complete the Punchlist.
964

965 **(D) Punchlist; Clean Up and Final Inspection.** Upon receiving a
966 punchlist after pre-final inspection, the Contractor shall promptly devote all
967 required time, labor, equipment, materials and incidentals to correct and
968 remedy all punchlist deficiencies. The Engineer may add to or otherwise
969 modify this punchlist until substantial completion of the project.
970

971 Before final inspection of the work, the Contractor shall clean all
972 ground occupied by the Contractor in connection with the work of all
973 rubbish, excess materials temporary structures and equipment, shall
974 remove all graffiti and defacement of the work and all parts of the work and
975 the worksite must be left in a neat and presentable condition to the
976 satisfaction of the Engineer.
977

978 Final inspection will occur within ten working days after the
979 Contractor notifies the Engineer in writing that all punchlist deficiencies
980 remaining after the pre-final inspection have been completed and the
981 Engineer concurs. If the Engineer determines that deficiencies still remain
982 at the final inspection, the work will not be accepted and the Engineer will
983 notify the Contractor, in writing, of the deficiencies which shall be corrected
984 and the steps above repeated.
985

986 If the Contractor fails to correct the deficiencies and complete the
987 work by the established or agreed date, the State may correct the
988 deficiencies by whatever method it deems appropriate and deduct the cost
989 from any payments due the Contractor.
990

991 **108.14 Substantial Completion and Final Acceptance.**

992

993 **(A) Substantial Completion.** When the Engineer finds that the
994 Contractor has satisfactorily completed all work for the project in
995 compliance with the contract, with the exception of the planting period and
996 the plant establishment period, the Engineer will notify the Contractor, in
997 writing, of the project's substantial completion, effective as of the date of the

998 final inspection. The substantial completion date shall determine end of
999 contract time and relieve contractor of any additional accumulation of
1000 liquidated damages for failure to complete the punchlist.

1001
1002 **(B) Final Acceptance.** When the Engineer finds that the Contractor has
1003 satisfactorily completed all contract work in compliance with the contract
1004 including all plant establishment requirements, and all the materials have
1005 been accepted by the State, the Engineer will issue a Final Acceptance
1006 Letter. The Final Acceptance date shall determine the commencement of
1007 all guaranty periods subject to Subsection 108.16 – Contractor’s
1008 Responsibility for Work; Risk of Loss or Damage.

1009
1010 **108.15 Use of Structure or Improvement.** The State has the right to use the
1011 structure, equipment, improvement, or any part thereof, at any time after it is
1012 considered by the Engineer as available. In the event that the structure,
1013 equipment or any part thereof is used by the State before final acceptance, the
1014 Contractor is not relieved of its responsibility to protect and preserve all the work
1015 until final acceptance.

1016
1017 **108.16 Contractor’s Responsibility for Work; Risk of Loss or Damage.**
1018 Until the written notice of final acceptance has been received, the Contractor shall
1019 take every precaution against loss or damage to any part of the work by the action
1020 of the elements or from any other cause whatsoever, whether arising from the
1021 performance or from the non-performance of the work. The Contractor shall
1022 rebuild, repair, restore and make good all loss or damage to any portion of the
1023 work resulting from any cause before its receipt of the written notice of final
1024 acceptance and shall bear the risk and expense thereof.

1025
1026 The risk of loss or damage to the work from any hazard or occurrence that
1027 may or may not be covered by a builder’s risk policy is that of the Contractor and
1028 Surety, unless such risk of loss is placed elsewhere by express language in the
1029 contract documents.

1030
1031 **108.17 Guarantee of Work.**

1032
1033 **(1)** Regardless of, and in addition to, any manufacturers’ warranties, all
1034 work and equipment shall be guaranteed by the Contractor against defects
1035 in materials, equipment or workmanship for one year from the date of final
1036 acceptance or as otherwise specified in the contract documents.

1037
1038 **(2)** When the Engineer determines that repairs or replacements of any
1039 guaranteed work and equipment is necessary due to materials, equipment,
1040 or workmanship which are inferior, defective, or not in accordance with the
1041 terms of the contract, the Contractor shall, at no increase in contract price
1042 or contract time, and within five working days of receipt of written notice
1043 from the State, commence to all of the following:

1044
1045
1046
1047
1048
1049
1050
1051
1052
1053
1054
1055
1056
1057
1058
1059
1060
1061
1062
1063
1064
1065
1066
1067
1068
1069
1070
1071
1072
1073
1074
1075
1076
1077
1078
1079
1080
1081
1082
1083
1084
1085
1086
1087
1088
1089

(a) Correct all noted defects and make replacements, as directed by the Engineer, in the equipment and work.

(b) Repair or replace to new or pre-existing condition any damages resulting from such defective materials, equipment or installation thereof.

(3) The State will be entitled to the benefit of all manufacturers and installers warranties that extend beyond the terms of the Contractor's guaranty regardless of whether or not such extended warranty is required by the contract documents. The Contractor shall prepare and submit all documents required by the providers of such warranties to make them effective, and submit copies of such documents to the Engineer. If an available extended warranty cannot be transferred or assigned to the State as the ultimate user, the Contractor shall notify the Engineer who may direct that the warranted items be acquired in the name of the State as purchaser.

(4) If a defect is discovered during a guarantee period, all repairs and corrections to the defective items when corrected shall be guaranteed for a new duration equal to the original full guarantee period. The running of the guarantee period shall be suspended for all other work affected by any defect. The guarantee period for all other work affected by any such defect shall restart for its remaining duration upon confirmation by the Engineer that the deficiencies have been repaired or remedied.

(5) Nothing in this section is intended to limit or affect the State's rights and remedies arising from the discovery of latent defects in the work after the expiration of any guarantee period.

108.18 No Waiver of Legal Rights. The following will not operate or be considered as a waiver of any portion of the contract, or any power herein reserved, or any right to damages provided herein or by law:

- (1) Any payment for, or acceptance of, the whole or any part of the work.
- (2) Any extension of time.
- (3) Any possession taken by the Engineer.

A waiver of any notice requirement or of any noncompliance with the contract will not be held to be a waiver of any other notice requirement or any other noncompliance with the contract.

108.19 Final Settlement of Contract.

1090
1091
1092
1093
1094
1095
1096
1097
1098
1099
1100
1101
1102
1103
1104
1105
1106
1107
1108
1109
1110
1111
1112
1113
1114
1115
1116
1117
1118
1119
1120
1121
1122
1123

(A) Closing Requirements. The contract will be considered settled after the project acceptance date and when the following items have been satisfactorily submitted, where applicable:

- (1)** All written guarantees required by the contract.
- (2)** Complete and certified weekly payrolls for the Contractor and its subcontractor's.
- (3)** Certificate of plumbing and electrical inspection.
- (4)** Certificate of building occupancy.
- (5)** Certificate for soil treatment and wood treatment.
- (6)** Certificate of water system chlorination.
- (7)** Certificate of elevator inspection, boiler and pressure pipe installation.
- (8)** Tax clearance.
- (9)** All other documents required by the Contract or by law.

(B) Failure to Meet Closing Requirements. The Contractor shall meet the applicable closing requirements within 60 days from the date of Project Acceptance or the agreed to Punchlist complete date. Should the Contractor fail to comply with these requirements, the Engineer may terminate the contract for cause.”

END OF SECTION 108

1 **SECTION 109 - MEASUREMENT AND PAYMENT**

2
3 Make the following amendment to said Section:

4
5 **(I)** Amend **Subsection 109.05 Allowances for Overhead and Profit** by
6 revising lines 101 to 110 to read as follows:

7
8 **“(1)** 20 percent of the direct cost for any work performed by the
9 Contractor’s own labor force.

10
11 **(2)** 20 percent of the direct cost for any work performed by each
12 subcontractor’s own labor force.

13
14 **(3)** For the Contractor or any subcontractor for work performed
15 by their respective subcontractor or tier subcontractor, 10 percent
16 of the amount due to the performing subcontractor or tier
17 subcontractor.”

18
19 **(II)** Amend **109.08(A) Monthly Payment** by adding the following after line
20 411:

21
22 **“(1) Retainage.** If the Engineer finds that the Contractor is
23 progressing satisfactorily in completing the project work and:

24
25 **a.** Less than 50% of the whole contract cost is complete,
26 the Engineer shall retain 5% of the value of the work done
27 until the Engineer makes final payment;

28
29 **b.** More than 50% of the whole contract cost is
30 complete, the Engineer may make the remaining progress
31 payments in full.

32
33 **c.** After satisfactory completion of work other than
34 landscaping items, the Engineer may adjust the amount of
35 retainage to 15% of the landscaping items or 2½% of the
36 total contract amount whichever is less. Do not use this
37 subsection if the contract is only landscaping.”

38
39 **(III)** Amend **Subsection 109.08(B) Payment for Material On Hand** by
40 revising lines 421 to 423 to read as follows:

41
42 **“(2)** The materials shall be stored and handled in accordance
43 with Subsection 105.14 – Storage and Handling of Materials and
44 Equipment.”

47 **(IV)** Amend **Subsection 109.11 Final Payment** by revising lines 568 to 576
48 to read as follows:

49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73

(3) A current “Certificate of Vendor Compliance” issued by the Hawaii Compliance Express (HCE). The Certificate of Vendor Compliance is used to certify the Contractor’s compliance with

(a) Section 103D-328, HRS (for all contracts \$25,000 or more) which requires a current tax clearance certificate issued by the Hawaii State Department of Taxation and the Internal Revenue Service;

(b) Chapters 383, 386, 392, and 393, HRS; and

(c) Subsection 103D-310(c), HRS. The State reserves the right to verify that compliance is current prior to the issuance of final payment. Contractors are advised that non-compliance status will result in final payment being withheld until compliance is attained.

Sums necessary to meet the claims of any governmental agencies may be withheld from the sums due the Contractor until said claims have been fully and completely discharged or otherwise satisfied.”

END OF SECTION 109

1 **SECTION 201 – CLEARING AND GRUBBING**
2

3 Make the following amendments to said Section:
4

5 **(I)** Add the following paragraphs to Subsection **201.03(E) Grubbing**, after
6 line 140, to read as follows:
7

8 “Grubbing shall consist of stripping the top 12 inches of the organically
9 laden soils and mixed with other vegetative matter. Soft and yielding areas
10 encountered during clearing and grubbing below areas designated to receive fill
11 shall be over-excavated to expose firm natural material, and the resulting
12 excavation shall be backfilled with well-compacted fill. The stripped soils from
13 grubbing and excavated soft soils shall be properly disposed of off-site.
14

15 Over-excavated subgrades and areas designated to receive fills exposing
16 generally stiff materials shall be scarified to a minimum depth of 8 inches,
17 moisture-conditioned to at least 4 percent above the optimum moisture content,
18 and compacted to a minimum of 90 percent relative compaction. Relative
19 compaction refers to the in-place dry density of soil expressed as a percentage of
20 the maximum dry density of the same soil determined in accordance with
21 AASHTO T-180 (or ASTM D1557). Optimum moisture is the water content
22 (percentage by dry weight) corresponding to the maximum dry density.
23

24 Where shrinkage cracks (wider than 1/8-inch in width) are noted after
25 compaction of the subgrade, the soil shall be prepared again as required above.
26 Saturation and subsequent yielding of the exposed subgrade due to inclement
27 weather and poor drainage shall be over-excavated of the softened areas and
28 replacement with well-compacted fill at no additional cost to the State, as
29 directed by the Engineer.”
30

31 **(II)** Amend **201.04 – Measurement** by revising lines 167 to 168 to read as
32 follows:
33

34 **“201.04 Measurement.** The Engineer will measure clearing and grubbing
35 per acre in accordance with the contract documents.”
36

37 **(III)** Amend **201.05 – Payment** by revising lines 170 to 179 to read as follows:
38

39 **“201.05 Payment.** The Engineer will pay for the accepted clearing and
40 grubbing per acre. Payment will be full compensation for the work prescribed in
41 this section and the contract documents.
42

43 The Engineer will pay for the following pay items when included in the
44 proposal schedule:
45

Pay Item	Pay Unit
-----------------	-----------------

47
48
49
50
51
52
53

Clearing and Grubbing

Acre”

END OF SECTION 201

1 **SECTION 202 – REMOVAL OF STRUCTURES AND OBSTRUCTIONS**

2
3 Make the following amendments to said Section:

4
5 **(I)** Add the following paragraphs to Subsection **202.03(C) Removal of**
6 **Bridges**, line 118, to read as follows:

7
8 “All concrete and/or reinforcing steel removed shall be recycled by an
9 appropriately licensed or certified concrete recycling facility.”

10
11 **(II)** Amend **202.04 – Measurement** by revising lines 119 to 120 to read as
12 follows:

13
14 **“202.04 Measurement.** The Engineer will not measure the demolition and
15 removal of structures and obstructions when contracted on a lump sum basis.”

16
17 **(III)** Amend **202.05 – Payment** by revising lines 122 to 131 to read as follows:

18
19 **“202.05 Payment.** If the proposal does not show a contract item for the
20 removal of structures and obstructions, the Engineer will not pay for the removal
21 of structures and obstructions separately. The Contractor shall consider them
22 incidental to the various contract items.

23
24 The Engineer will pay for specific items stipulated for demolition, removal
25 and disposal at the contract price bid per unit specified in the proposal. The price
26 shall be full compensation for removal and disposal of that items, excavation,
27 backfill, salvage of materials removed. Salvaging of materials removed includes
28 their custody, preservation, storage on the right-of-way. Also, the price shall be
29 full compensation for equipment, tools, labor materials and incidentals necessary
30 to complete the work.

31
32 The Engineer will pay for the following pay item when included in the
33 proposal schedule.

34

Pay Item	Pay Unit
Removal of _____	Lump Sum”

35
36
37
38
39
40
41

END OF SECTION 202

1 **SECTION 203 – EXCAVATION AND EMBANKMENT**

2
3 Make the following amendments to said Section:

4
5 **(I)** Amend **203.03(C)(2)(a) – Maximum Dry Unit Weight** from line 245 to line
6 255 to read as follows:

7
8 **“(a) Maximum Dry Unit Weight.** Test for maximum dry
9 unit weight according to AASHTO T 180, and apply the
10 correction for fraction larger than 3/4 inch. Use Hawaii
11 Test Method HDOT TM 5 for sample preparation of sensitive
12 soils when so designated by the Engineer.”

13
14 **(II)** Amend **203.03(C)(3) – Compaction of Cut Areas and Embankments**
15 **With Moisture and Density Tests** from line 261 to line 284 to read as follows:

16
17 **(3) Compaction of Cut Areas and Embankments With**
18 **Moisture and Density Tests.** Prior to shaping and
19 compacting, condition the on-site clayey soil to a moisture
20 content of at least 4 percent above optimum moisture
21 content determined in accordance with AASHTO T 180.
22 Moisture condition embankment material and place in layers
23 not to exceed 8 inches in loose thickness, and compact each
24 layer of material as specified, before placement of next lift.
25 Determine maximum density and relative compaction in
26 accordance with Subsection 203.03(C)(2) – Relative
27 Compaction Test.

28
29 In-situ soil or embankment material contained in prism within
30 2 feet below subgrade and within width of traveled way,
31 auxiliary lane, and shoulder on each side shall have relative
32 compaction of 95 percent or more. When in-situ material
33 within 2 feet below subgrade does not conform to specified
34 moisture condition or the relative compaction, excavate and
35 recompact material until specified moisture condition and
36 relative compaction is achieved.

37
38 Top 6 inches of in-situ material and embankment material
39 below top 2 feet of subgrade, and beyond traveled way,
40 auxiliary lane, and shoulder prism, shall have relative
41 compaction of at least 90 percent. When in-situ material
42 cannot be compacted to 90 percent, provide working
43 platform to allow 90 percent compaction of first lift.”

44
45 **(III)** Amend **203.04 – Measurement** by revising lines 345 to 366 to read as
46 follows:

47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92

“203.04 Measurement.

(A) The Engineer will measure roadway excavation per cubic yard. The Engineer will compute quantities of roadway excavation by average end area method and centerline distances. Curvature correction will not be applied to quantities within roadway prism, as indicated in the contract documents. In computing excavation quantities from outside the roadway prism, where roadway centerline is used as a base, curvature correction will be applied when centerline radius is 1,000 feet or less.

When roadway excavation quantities by average end area method cannot be computed due to the nature of a particular operation or changed conditions, the Engineer will determine and use computation method that will produce an accurate quantity estimate.

(B) The Engineer will measure imported borrow per cubic yard in accordance with the contract documents. The Engineer will compute quantities of imported borrow incorporated into the work on a volume basis, using average end area method in place at work site.

(III) Amend **203.05 – Payment** by revising lines 368 to 457 to read as follows:

“203.05 Payment. The Engineer will pay for the accepted pay items listed below at the contract price per pay unit, as shown in the proposal schedule. Payment will be full compensation for the work prescribed in this section and the contract documents.

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

Pay Item	Pay Unit
Roadway Excavation	Cubic Yard

The Engineer will pay for:

(1) 15 percent of the contract bid price upon completion of obliterating old roadways and hauling.

(2) 30 percent of the contract bid price upon completion of preparing subgrade.

(3) 40 percent of the contract bid price upon completion of placing selected material in final position, rounding of slopes, and using water for compaction.

93
94
95
96
97
98
99
100
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134

(4) 15 percent of the contract bid price upon completion of disposing of surplus excavation material.

Imported Borrow Cubic Yard

The Engineer will pay for accepted quantities of subexcavation, as roadway excavation at the contract unit price per cubic yard, when ordered by the Engineer, for work prescribed in Subsection 203.03(A)(4) – Subexcavation. Payment will be full compensation for the work prescribed therein and in the contract documents.

The Engineer will pay for accepted quantities of unlined gutter excavation as roadway excavation at the contract unit price per cubic yard, when gutter is located as follows: within median area of a divided highway; and between roadbed shoulder and adjacent cut slope. Payment will be full compensation for removing and disposing of excavated material; backfilling and compacting; and for the work prescribed in the contract documents.

The Engineer will not pay for stockpiling selected material, placing selected material in final position, or placing selected material in windrows along tops of roadway slopes for erosion control work, separately and will consider the cost as included in the unit prices for the various excavation contract pay items. The cost is for work prescribed in this section and the contract documents.

The Engineer will not pay for overhaul separately and will consider the cost as included in the unit prices for the various excavation contract pay items. The cost is for work prescribed in this section and the contract documents.

The Engineer will not pay for embankment separately and will consider the cost as included in the unit price for roadway excavation. The cost is for work prescribed in this section and the contract documents.

The Engineer will not pay for Non-Woven Geotextile Fabric (Mirafi 180N or approved equal) separately and will consider the cost as included in the unit price for roadway excavation. The cost is for work prescribed in this section and the contract documents.”

END OF SECTION 203

1 **SECTION 204 – EXCAVATION AND BACKFILL FOR MISCELLANEOUS**
 2 **FACILITIES**

3
 4 Make the following amendments to said Section:

5
 6 **(I)** Amend **204.04 – Measurement** by revising lines 180 to 186 to read as
 7 follows:

8
 9 **“204.04 Measurement.**

10
 11 **(A)** The Engineer will measure trench excavation for Water Lines and
 12 Sewer Lines per cubic yard in accordance with the contract
 13 documents.

14
 15 **(B)** Gas Pipeline trench excavation will be paid on a lump sum basis.
 16 Measurement for payment will not apply.

17
 18 **(C)** The Engineer will measure trench backfill for Water Lines and
 19 Sewer Lines per cubic yard in accordance with the contract
 20 documents.

21
 22 **(D)** Gas Pipeline trench backfill will be paid on a lump sum basis.
 23 Measurement for payment will not apply.”

24
 25 **(II)** Amend **204.05 – Payment** by revising lines 196 to 200 to read as follows:

26
 27 **“ Pay Item Pay Unit**

28		
29	Trench Excavation for Water Lines	Cubic Yard
30		
31	Trench Backfill for Water Lines	Cubic Yard
32		
33	Trench Excavation for Sewer Lines	Cubic Yard
34		
35	Trench Backfill for Sewer Lines	Cubic Yard
36		
37	Trench Excavation for Gas Pipelines	Lump Sum
38		
39	Trench Backfill for Gas Pipelines	Lump Sum”

40
 41 **(III)** Amend **204.05 – Payment** by adding the following paragraph after line
 42 220 to read as follows:

43
 44 “The Engineer will not pay for excavation and backfill for the permanent
 45 irrigation system separately and will consider the cost for those items as included

46 in the contract prices for the permanent irrigation system. The cost is for the
47 work prescribed in this section and the contract documents.”

48

49

50

51

END OF SECTION 204

1 **SECTION 205 – EXCAVATION AND BACKFILL FOR BRIDGE AND**
2 **RETAINING STRUCTURES**

3
4 Make the following amendments to said Section:

5
6
7 **(I)** Amend **205.01 Description** by revising subparagraph (A) between lines 5
8 and 8 to read as follows:

9
10 **“(A)** Excavating and backfilling to depths and lines established for
11 bridge, overhead-mounted expressway sign, retaining (reinforced concrete
12 or cement rubble masonry) structures, foundations, and box culverts.”

13
14 **(II)** Amend **205.03(A)(1) General** by adding the following paragraph
15 after line 47 to read as follows:

16
17 “The Contractor shall be responsible for protecting the sides of the
18 excavations from cave-ins. The Contractor shall submit shop drawings and
19 calculations for any bracing or shoring to be installed. The shop drawings and
20 calculations shall be stamped by a registered Hawaii Structural Engineer and a
21 registered Civil Engineer specializing in Geotechnical Engineering in the State of
22 Hawaii. If the Contractor decides not to brace the cut slope, the Contractor shall
23 submit when requested by the Engineer, calculations, showing the stability of the
24 slope, stamped by a registered Civil Engineer specializing in Geotechnical
25 Engineer in the State of Hawaii. The shop drawings and calculations shall be
26 reviewed and accepted by the Engineer before proceeding with the construction.”

27
28 **(III)** Amend **205.03(B) Structure Backfill** by revising the lines 151 to 155 to
29 read as follows:

30
31 **“(B) Structure or CLSM Backfill.** Place structure or CLSM backfill
32 material A behind bridge abutments, wingwalls, and retaining structures. Do not
33 deposit fill material against back of concrete abutments, piers, concrete box
34 culverts, retaining structures, and foundations until the concrete has met the
35 requirements in Subsection 503.03(E) – Loading.”

36
37 **(IV)** Amend **Section 205.03(C) Filter Material** by revising the first sentence to
38 read as follows:

39
40 “Place backfill filter material at bridge and retaining structures in
41 accordance with the contract documents.”

42
43 **(V)** Amend **205.03(B) Structures Backfill** by revising the second sentence of
44 the second paragraph at lines 158 and 159 to read as follows:

46 “Continue backfilling so that uneven or unsymmetrical lifts do not exceed
47 16 inches in height creating an unbalanced loading condition.”

48
49 **(VI) Amend 205.04 – Measurement** by revising lines 206 to 214 to read as
50 follows:

51
52 **“(A) Structure Excavation.** Structure excavation will be paid per cubic
53 yard. The limits for payment of structure excavation shall be shown on the
54 plans and contract documents.

55
56 **(B) Structure Backfill.** Structure backfill for bridge abutments,
57 wingwalls, and retaining walls will be paid per cubic yard. The limits for
58 payment of structure backfill shall be shown on the plans and contract
59 documents.

60
61 **(C) CLSM Backfill.** CLSM backfill for bridge abutments, wingwalls,
62 and retaining walls will be paid per cubic yard. The limits for payment of
63 structure backfill shall be shown on the plans and contract documents.

64
65 **(D) Filter Material.** Filter material will be paid per cubic yard. The
66 limits for payment of filter material shall be shown on the plans and
67 contract documents.”

68
69 **(VII) Amend 205.05 – Payment** by revising lines 216 to 230 to read as follows:

70
71 **205.05 Payment.** The Engineer will pay for the accepted pay items listed
72 below per cubic yard as shown in the proposal schedule. Payment will be full
73 compensation for the work prescribed in this section and the contract documents.

74
75 The Engineer will pay of each of the following pay items when included in the
76 proposal schedule:

Pay Item	Pay Unit
Structure Excavation for _____	Cubic Yard
Structure Backfill for _____	Cubic Yard
CLSM Backfill for _____	Cubic Yard
Filter Material	Cubic Yard”

87
88
89
90 **END OF SECTION 205**

1 **SECTION 206 – EXCAVATION AND BACKFILL**
2 **FOR DRAINAGE FACILITIES**

3
4 Make the following amendments to said Section:

5
6 **(I)** Amend **206.04 – Measurement** by revising lines 142 to 143 to read as
7 follows:

8
9 **“206.04 Measurement.** The Engineer will measure excavation per cubic yard
10 in accordance with contract documents.”

11
12 **(II)** Amend **206.05 – Payment** by revising lines 145 to 154 to read as follows:

13
14 **“206.05 Payment.** The Engineer will pay for the accepted excavation per
15 cubic yard. Payment will be full compensation for the work prescribed in this
16 section and contract documents.

17
18 The Engineer will pay for the following pay item when included in the
19 proposal schedule:

Pay Item	Pay Unit
Excavation for Drain Lines and Drain Culvert	Cubic Yard”

20
21
22
23 **END OF SECTION 206**
24
25
26

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42

SECTION 207 — DITCH AND CHANNEL EXCAVATION

Make the following amendments to said Section:

(I) Amend **207.04 - Measurement** by revising lines 35 to 41 to read as follows:

"207.04 Measurement.

The Engineer will measure basin and channel excavation per cubic yard in accordance with the contract documents. Excavation will be measured after clearing and grubbing."

(II) Amend **207.05 - Payment** by revising lines 43 to 65 to read as follows:

"207.05 Payment. The Engineer will pay for the accepted pay item listed below at the contract price per pay unit, as shown in the proposal schedule. Payment will be full compensation for the work prescribed in this section and the contract documents.

The Engineer will pay for the following pay item when included in the proposal schedule:

Pay Item	Pay Unit
Channel Excavation (Kaloi and Honouliuli)	Cubic Yard
Basin Excavation	Cubic Yard
(1) 80% of the contract bid price upon completion of clearing and grubbing, excavating ditch, and backfilling and compacting below required bottom grade of ditches and channels.	
(2) 20% of the contract bid price upon completion of disposing unsuitable and surplus material.	

The Engineer will not pay for clearing and grubbing in accordance with Section 201- Clearing and Grubbing.

END OF SECTION 207

1 Amend **Section 209 - TEMPORARY WATER POLLUTION, DUST, AND EROSION**
2 **CONTROL** to read as follows:

3
4
5 **“SECTION 209 - TEMPORARY WATER POLLUTION, DUST, AND EROSION**
6 **CONTROL**

7
8
9 **209.01 Description.** This section describes the following:

10
11 **(A)** Including detailed plans, diagrams, and written Site-Specific Best
12 Management Practices (BMP); constructing, maintaining, and repairing
13 temporary water pollution, dust, and erosion control measures at the project
14 site, including local material sources, work areas and haul roads; removing
15 and disposing hazardous wastes; control of fugitive dust (defined as
16 uncontrolled emission of solid airborne particulate matter from any source
17 other than combustion); and complying with applicable State and Federal
18 permit conditions.

19
20 **(B)** Work associated with construction stormwater, dewatering, and
21 hydrotesting activities and complying with conditions of the National Pollutant
22 Discharge Elimination System (NPDES) permit(s) authorizing discharges
23 associated with construction stormwater, dewatering, and hydrotesting
24 activities.

25
26 **(C)** Potential pollutant identification and mitigation measures are listed in
27 Appendix A for use in the development of the Contractor’s Site-Specific BMP.

28
29 Requirements of this section also apply to construction support
30 activities including concrete or asphalt batch plants, rock crushing plants,
31 equipment staging yards/areas, material storage areas, excavated material
32 disposal areas, and borrow areas located outside the State Right-of-Way.
33 For areas serving multiple construction projects, or operating beyond the
34 completion of the construction project in which it supports, the Contractor
35 shall be responsible for securing the necessary permits, clearances, and
36 documents, and following the conditions of the permits and clearances, at no
37 cost to the State.

38
39 **209.02 Materials.** Comply with applicable materials described in Chapters 2 and
40 3 of the current HDOT “Construction Best Management Practices Field Manual”. In
41 addition, the materials shall comply with the following:

42
43 **(A) Grass.** Grass shall be a quick growing species such as rye grass,
44 Italian rye grass, or cereal grasses. Grass shall be suitable to the area and
45 provide a temporary cover that will not compete later with permanent cover.
46 Alternative grasses are allowable if acceptable to the Engineer.

47 **(B) Fertilizer and Soil Conditioners.** Fertilizer and soil conditioners shall
48 be a standard commercial grade acceptable to the Engineer. Fertilizer shall
49 conform to Subsection 619.02(H)(1) - Commercial Fertilizer.
50

51 **(C) Hydro-mulching.** Hydro-mulching used as a temporary vegetative
52 stabilization measure shall consist of materials in Subsections 209.02(A) -
53 Grass, and 209.02(B) – Fertilizer and Soil Conditioners. Mulches shall be
54 recycled materials including bagasse, hay, straw, wood cellulose bark, wood
55 chips, or other material acceptable to the Engineer. Mulches shall be clean
56 and free of noxious weeds and deleterious materials. Potable water shall
57 meet the requirements of Subsection 712.01 - Water. Submit alternate
58 sources of irrigation water for the Engineer’s acceptance if deviating from
59 712.01 - Water. Installation and other requirements shall be in accordance
60 with portions of Section 641- Hydro-Mulch Seeding including 641.02(D) - Soil
61 and Mulch Tackifier, 641.03(A) – Seeding, and 641.03(B) - Planting Period.
62 Install non-vegetative controls including mulch or rolled erosion control
63 products while the vegetation is being established. Water and fertilize grass.
64 Apply fertilizer as recommended by the manufacturer. Replace grass the
65 Engineer considers unsuitable or sick. Remove and dispose of trash and
66 debris. Remove invasive species. Mow as needed to prevent site or signage
67 obstructions, fire hazard, or nuisance to the public. Do not remove down
68 stream sediment control measures until the vegetation is uniformly
69 established, including no large bare areas, and provides 70 percent of the
70 density of pre-disturbance vegetation. Temporary vegetative stabilization
71 shall not be used longer than one year.
72

73 **(D) Silt Fences.** Comply with ASTM D6462, Standard Practice for Silt
74 Fence Installation.
75

76 Alternative materials or methods to control, prevent, remove and dispose
77 pollution are allowable if acceptable to the Engineer.
78

79 **209.03 Construction.**
80

81 **(A) Preconstruction Requirements.**
82

83 **(1) Water Pollution, Dust, and Erosion Control Meeting.**
84 Schedule a water pollution, dust, and erosion control meeting with the
85 Engineer after Site-Specific BMP is accepted in writing by the
86 Engineer. Meeting shall be scheduled a minimum of 7 calendar days
87 prior to the Start Work Date. Discuss sequence of work, plans and
88 proposals for water pollution, dust, and erosion control.
89

90 **(2) Water Pollution, Dust, and Erosion Control Submittals.**
91 **Submit a Site-Specific BMP Plan within 21 calendar days of date of**
92 **NTP. Refer to Section 108 – Prosecution and Progress for details on**
93 **NTP date.** Submission of complete and acceptable Site-Specific BMP
94 Plan is the sole responsibility of the Contractor and additional contract
95 time will not be issued for delays due to incompleteness. Include the
96 following:

97
98 **(a)** Written description of activities to minimize water
99 pollution and soil erosion into State waters, drainage or sewer
100 systems. BMP shall include the following:

- 101
102 **1.** An identification of potential pollutants and their
103 sources.
- 104
105 **2.** A list of all materials and heavy equipment to be
106 used during construction.
- 107
108 **3.** Descriptions of the methods and devices used to
109 minimize the discharge of pollutants into State waters,
110 drainage or sewer systems.
- 111
112 **4.** Details of the procedures used for the
113 maintenance and subsequent removal of any erosion or
114 siltation control devices.
- 115
116 **5.** Methods of removing and disposing hazardous
117 wastes encountered or generated during construction.
- 118
119 **6.** Methods of removing and disposing concrete and
120 asphalt pavement cutting slurry, concrete curing water,
121 and hydrodemolition water.
- 122
123 **7.** Spill Control and Prevention and Emergency Spill
124 Response Plan.
- 125
126 **8.** Fugitive dust control, including dust from grinding,
127 sweeping, or brooming off operations or combination
128 thereof.
- 129
130 **9.** Methods of storing and handling of oils, paints
131 and other products used for the project.
- 132
133 **10.** Material storage and handling areas, and other
134 staging areas.
- 135

136
137
138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181

- 11. Concrete truck washouts.
- 12. Concrete waste control.

- 13. Fueling and maintenance of vehicles and other equipment.

- 14. Tracking of sediment offsite from project entries and exits.

- 15. Litter management.

- 16. Toilet facilities.

- 17. Other factors that may cause water pollution, dust and erosion control.

(b) Provide plans indicating location of water pollution, dust and erosion control devices; provide plans and details of BMPs to be installed or utilized; show areas of soil disturbance in cut and fill, indicate areas used for construction staging and storage including items (1) through (17) above, storage of aggregate (indicate type of aggregate), asphalt cold mix, soil or solid waste, equipment and vehicle parking, and show areas where vegetative practices are to be implemented. Indicate intended drainage pattern on plans. Include flow arrows. Include separate drawing for each phase of construction that alters drainage patterns. Indicate approximate date when device will be installed and removed.

(c) Construction schedule.

(d) Name(s) of specific individual(s) designated responsible for water pollution, dust, and erosion controls on the project site. Include home, cellular, and business telephone numbers, fax numbers, and e-mail addresses.

(e) Description of fill material to be used.

(f) For projects with an NPDES Permit for Construction Activities, submit information to address all sections in the Storm Water Pollution Prevention Plan (SWPPP).

(g) For projects with an NPDES Permit, information required for compliance with the conditions of the Notice of General Permit Coverage (NGPC)/NPDES Permit.

182 (h) Site-Specific BMP Review Checklist. The checklist may
183 be downloaded from HDOT’s Stormwater Management
184 website at <http://stormwaterhawaii.com>.
185

186 Date and sign Site-Specific BMP Plan. Keep accepted
187 copy on site or at an accessible location so that it can be made
188 available at the time of an on-site inspection or upon request by
189 the Engineer, HDOT Third-Party Inspector, and/or DOH/EPA
190 Representative. Amendments to the Site-Specific BMP Plan
191 shall be included with original Site-Specific BMP Plan. Modify
192 SWPPP if necessary to conform to revisions. Include date of
193 installation and removal of Site-Specific BMP measures.
194 Obtain written acceptance by the Engineer before
195 implementing revised Site-Specific BMPs in the field.
196

197 Follow the guidelines in the current HDOT “Construction
198 Best Management Practices Field Manual”, in developing,
199 installing, and maintaining Site-Specific BMPs for all projects.
200 For any conflicting requirements between the Manual and
201 applicable bid documents, the applicable bid documents will
202 govern. Should a requirement not be clearly described within
203 the applicable bid documents, notify the Engineer immediately
204 for interpretation. For the purposes of clarification “applicable
205 bid documents” include the construction plans, standard
206 specifications, special provisions, Permits, and the SWPPP
207 when applicable.
208

209 Follow Honolulu’s City and County “Rules for Soil
210 Erosion Standards and Guidelines” for all projects on Oahu.
211 Use respective Soil Erosion Guidelines for Maui, Kauai and
212 Hawaii projects.
213

214 **(B) Construction Requirements.** Do not begin work until submittals
215 detailed in Subsection 209.03(A)(2) - Water Pollution, Dust, and Erosion
216 Control Submittals are completed and accepted in writing by the Engineer.
217

218 Install, maintain, monitor, repair and replace site-specific BMP
219 measures, such as for water pollution, dust and erosion control; installation,
220 monitoring, and operation of hydrotesting activities; removal and disposal of
221 hazardous waste indicated on plans, concrete cutting slurry, concrete curing
222 water; or hydrodemolition water. Site-Specific BMP measures shall be in
223 place, functional and accepted by HDOT personnel prior to initiating any
224 ground disturbing activities.
225

226 If necessary, furnish and install rain gage in a secure location prior to
227 field work including installation of site-specific BMP. Provide rain gage with
228 a tolerance of at least 0.05 inches of rainfall. Install rain gage on project site
229 in an area that will not deter rainfall from entering the gate opening. Do not
230 install in a location where rain water may splash into rain gage. The rain
231 gage installation shall be stable and plumbed. Maintain rain gage and
232 replace rain gage that is stolen, does not function properly or accurately, is
233 worn out, or needs to be relocated. Do not begin field work until rain gage is
234 installed and Site-Specific BMPs are in place. Rain gage data logs shall be
235 readily available. Submit rain gage data logs weekly to the Engineer.

236
237 Address all comments received from the Engineer.

238
239 Modify and resubmit plans and construction schedules to correct
240 conditions that develop during construction which were unforeseen during
241 the design and pre-construction stages.

242
243 Coordinate temporary control provisions with permanent control
244 features throughout the construction and post-construction period.

245
246 Limit maximum surface area of earth material exposed at any time to
247 300,000 square feet. Do not expose or disturb surface area of earth material
248 (including clearing and grubbing) until BMP measures are installed and
249 accepted in writing by the Engineer. Protect temporarily or permanently
250 disturbed soil surface from rainfall impact, runoff and wind before end of the
251 work day.

252
253 Immediately initiate stabilizing exposed soil areas upon completion of
254 earth disturbing activities for areas permanently or temporarily ceased on any
255 portion of the site. Earth-disturbing activities have permanently ceased when
256 clearing and excavation within any area of the construction site that will not
257 include permanent structures has been completed. Earth-disturbing
258 activities have temporarily ceased when clearing, grading, and excavation
259 within any area of the site that will not include permanent structures will not
260 resume for a period of 14 or more calendar days, but such activities will
261 resume in the future. The term "immediately" is used in this section to define
262 the deadline for initiating stabilization measures. "Immediately" means as
263 soon as practicable, but no later than the end of the next work day, following
264 the day when the earth-disturbing activities have temporarily or permanently
265 ceased.

266
267 For projects with an NPDES Permit for Construction activities:
268

269
270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
292
293
294
295
296
297
298
299
300
301
302
303
304
305
306
307
308
309
310
311
312
313
314

(1) For construction areas discharging into **waters not impaired for** nutrients or sediments, complete initial stabilization within 14 calendar days after the temporary or permanent cessation of earth-disturbing activities.

(2) For construction areas discharging into nutrient or sediment impaired waters, complete initial stabilization within 7 calendar days after the temporary or permanent cessation of earth-disturbing activities.

For projects without an NPDES Permit for Construction activities, complete initial stabilization within 14 calendar days after the temporary or permanent cessation of earth-disturbing activities.

Any of the following types of activities constitutes initiation of stabilization:

- (1)** Prepping the soil for vegetative or non-vegetative stabilization;
- (2)** Applying mulch or other non-vegetative product to the exposed area;
- (3)** Seeding or planting the exposed area;
- (4)** Starting any of the activities in items (1) – (3) above on a portion of the area to be stabilized, but not on the entire area; and
- (5)** Finalizing arrangements to have stabilization product fully installed in compliance with the deadline for completing initial stabilization activities.

Any of the following types of activities constitutes completion of initial stabilization activities:

- (1)** For vegetative stabilization, all activities necessary to initially seed or plant the area to be stabilized; and/or
- (2)** For non-vegetative stabilization, the installation or application of all such non-vegetative measures.

If the Contractor is unable to meet the deadlines above due to circumstances beyond the Contractor’s control, and the Contractor is using vegetative cover for temporary or permanent stabilization, the Contractor may comply with the following stabilization deadlines instead as agreed to by the Engineer:

315 (1) Immediately initiate, and complete within the timeframe shown
316 above, the installation of temporary non-vegetative stabilization
317 measures to prevent erosion;

318
319 (2) Complete all soil conditioning, seeding, watering or irrigation
320 installation, mulching, and other required activities related to the
321 planting and initial establishment of vegetation as soon as conditions
322 or circumstances allow it on the site; and

323
324 (3) Notify and provide documentation to the Engineer the
325 circumstances that prevent the Contractor from meeting the deadlines
326 above for stabilization and the schedule the Contractor will follow for
327 initiating and completing initial stabilization and as agreed to by the
328 Engineer.

329
330 Follow the applicable requirements of the specifications and special
331 provisions including Section 619 Planting and Section 641 Hydro-Mulch
332 Seeding.

333
334 Immediately after seeding or planting the area to be vegetatively
335 stabilized, to the extent necessary to prevent erosion on the seeded or
336 planted area, select, design, and install non-vegetative erosion controls that
337 provide cover (e.g., mulch, rolled erosion control products) to the area while
338 vegetation is becoming established.

339
340 Protect exposed or disturbed surface area with mulches, grass seeds
341 or hydromulch. Spray mulches at a rate of 2,000 pounds per acre. Add
342 tackifier to mix at a rate of 85 pounds per acre. Apply grass seeds at a rate
343 of 125 pounds per acre. For hydromulch, use the ingredients and rates
344 required for mulches and grass seeds. Submit recommendations from a
345 licensed Landscape Architect when deviating from the application rates
346 above.

347
348 Apply fertilizer to mulches, grass seed or hydromulch per
349 manufacturer's recommendations. Submit recommendations from a licensed
350 Landscape Architect when deviating from the manufacturer's
351 recommendations.

352
353 Install velocity dissipation measures when exposing erodible surfaces
354 greater than 15 feet in height.

355
356 BMP measures shall be in place and operational at the end of work
357 day or as required by Section 209.03(B) Construction Requirements.

358

359 Install and maintain either or both stabilized construction entrances
360 and wheel washes to minimize tracking of dirt and mud onto roadways.
361 Restrict traffic to stabilized construction areas only. Clean dirt, mud, or other
362 material tracked onto the road, sidewalk, or other paved area by the end of
363 the same day in which the track-out occurs. Modify stabilized construction
364 entrances to prevent mud from being tracked onto road. Stabilize entire
365 access roads if necessary.

366
367 Chemicals may be used as soil stabilizers for either or both erosion
368 and dust control if acceptable to the Engineer.

369
370 Provide temporary slope drains of rigid or flexible conduits to carry
371 runoff from cuts and embankments. Provide portable flume at the entrance.
372 Shorten or extend temporary slope drains to ensure proper function.

373
374 Protect ditches, channels, and other drainageways leading away from
375 cuts and fills at all times by either:

376
377 (1) Hydro-mulching the lower region of embankments in the
378 immediate area.

379
380 (2) Installing check dams and siltation control devices.

381
382 (3) Other methods acceptable to the Engineer.

383
384 Provide for controlled discharge of waters impounded, directed, or
385 controlled by project activities or erosion control measures.

386
387 Cover exposed surface of materials completely with tarpaulin or
388 similar device when transporting aggregate, soil, excavated material or
389 material that may be source of fugitive dust.

390
391 Cleanup and remove any pollutant that can be attributed to the
392 Contractor.

393
394 Install or modify Site-Specific BMP measures due to change in the
395 Contractor's means and methods, or for omitted condition that should have
396 been allowed for in the accepted Site-Specific BMP or a Site-Specific BMP
397 that replaces an accepted Site-Specific BMP that is not satisfactorily
398 performing. Modifications to Site-Specific BMP measures shall be accepted
399 in writing by the Engineer prior to implementation.

400
401 Properly maintain all Site-Specific BMP measures.

402
403 For projects with an NPDES Permit for Construction Activities:

404

405 (1) For construction areas discharging into nutrient or sediment
406 impaired waters, inspect, prepare a written report, and make repairs
407 to BMP measures at the following intervals:

- 408
- 409 (a) Weekly.
 - 410
 - 411 (b) Within 24 hours of any rainfall of 0.25 inch or greater
 - 412 which occurs in a 24-hour period.
 - 413
 - 414 (c) When existing erosion control measures are damaged
 - 415 or not operating properly as required by Site-Specific BMP.
 - 416

417 (2) For construction areas discharging to waters not impaired for
418 nutrients or sediments, inspect, prepare a written report, and make
419 repairs to BMP measures at the following intervals:

- 420
- 421 (a) Weekly.
 - 422
 - 423 (b) When existing erosion control measures are damaged
 - 424 or not operating properly as required by Site-Specific BMP.
 - 425

426 For projects without an NPDES Permit for Construction activities,
427 inspect, prepare a written report, and make repairs to BMP measures at the
428 following intervals:

- 429
- 430 (a) Weekly.
 - 431
 - 432 (b) When existing erosion control measures are damaged
 - 433 or not operating properly as required by Site-Specific BMP.
 - 434

435 Temporarily remove, replace or relocate any Site-Specific BMP that
436 must be removed, replaced or relocated due to potential or actual flooding,
437 or potential danger or damage to project or public.

438

439 Maintain records of inspections of Site-Specific BMP work. Keep
440 continuous records for duration of the project. Submit copy of Inspection
441 Report to the Engineer within 24 hours after each inspection.

442

443 The Contractor's designated representative specified in Subsection
444 209.03(A)(2)(d) shall address any Site-Specific BMP deficiencies brought up
445 by the Engineer immediately, including weekends and holidays, and
446 complete work to fix the deficiencies by the close of the next work day if the
447 problem does not require significant repair or replacement, or if the problem
448 can be corrected through routine maintenance. Address any Site-Specific
449 BMP deficiencies brought up by the State's Third-Party Inspector in the
450 timeframe above or as specified in the Consent Decree or MS4 NPDES

451 Permit, whichever is more stringent. The Consent Decree timeframe
452 requirement applies statewide. The MS4 NPDES Permit only applies to
453 Oahu. In this section, "immediately" means the Contractor shall take all
454 reasonable measures to minimize or prevent discharge of pollutants until a
455 permanent solution is installed and made operational. If a problem is
456 identified at a time in the day in which it is too late to initiate repair, initiation
457 of repair shall begin on the following work day. When installation of a new
458 pollution prevention control or a significant repair is needed, complete
459 installation or repair no later than 7 calendar days from the time of
460 notification/Contractor discovery. Notify the Engineer and document why it
461 is infeasible to complete the installation or repair within 7 calendar days and
462 complete the work as soon as practicable and as agreed to by the Engineer.
463 Address Site-Specific BMP deficiencies discovered by the Contractor within
464 the timeframe above. The Contractor's failure to satisfactorily address these
465 Site-Specific BMP deficiencies, the Engineer reserves the right to employ
466 outside assistance or use the Engineer's own labor forces to provide
467 necessary corrective measures. The Engineer will charge the Contractor
468 such incurred costs plus any associated project engineering costs. The
469 Engineer will make appropriate deductions from the Contractor's monthly
470 progress estimate. Failure to apply Site-Specific BMP measures may result
471 in one or more of the following: assessment of liquidated damages,
472 suspension, or cancellation of Contract with the Contractor being fully
473 responsible for all additional costs incurred by the State.

474
475 **(C) Discharges of Storm Water Associated with Construction**
476 **Activities.** If work includes disturbance of one acre or more, an NPDES
477 Permit authorizing Discharges of Storm Water Associated with Construction
478 Activity (CWB-NOI Form C) or Individual Permit authorizing storm water
479 discharges associated with construction activity is required from the
480 Department of Health Clean Water Branch (DOH-CWB).

481
482 Do not begin construction activities until all required conditions of the
483 permit are met and submittals detailed in Subsection 209.03(A)(2) – Water
484 Pollution, Dust, and Erosion Control Submittals are completed and accepted
485 in writing by the Engineer.

486
487 **(D) Discharges Associated with Hydrotesting Activities.** If
488 hydrotesting activities require effluent discharge into State waters or drainage
489 systems, an NPDES Hydrotesting Waters Permit (CWB-NOI Form F) or
490 Individual Permit authorizing discharges associated with hydrotesting from
491 DOH-CWB is required from the DOH-CWB.

492
493 Do not begin hydrotesting activities until the DOH-CWB has issued an
494 Individual NPDES Permit or Notice of General Permit Coverage (NGPC).
495 Conduct Hydrotesting operations in accordance with the conditions of the
496 permit or NGPC.

497 **(E) Discharges Associated with Dewatering Activities.** If dewatering
498 activities require effluent discharge into State waters or drainage systems, an
499 NPDES Dewatering Permit (CWB-NOI Form G) or Individual Permit
500 authorizing discharges associated with dewatering from DOH-CWB is
501 required from the DOH-CWB.
502

503 Do not begin dewatering activities until the DOH-CWB has issued an
504 Individual NPDES Permit or Notice of General Permit Coverage (NGPC).
505 Conduct dewatering operations in accordance with the conditions of the
506 permit or NGPC.
507

508 **(F) Solid Waste.** Submit the Solid Waste Disclosure Form for
509 Construction Sites to the Engineer within 21 calendar days of date of award.
510 Provide a copy of all the disposal receipts from the facility permitted by the
511 Department of Health to receive solid waste to the Engineer monthly. This
512 should also include documentation from any intermediary facility where solid
513 waste is handled or processed, or as directed by the Engineer.
514

515 **(G) Construction BMP Training.** The Contractor's representative
516 responsible for development of the Site-Specific BMP Plan and
517 implementation of Site-Specific BMPs in the field shall attend the State's
518 Construction Best Management Practices Training. The Contractor shall
519 keep training logs updated and readily available.
520

521 **209.04 Measurement.**
522

523 **(A)** Installation, maintenance, monitoring, and removal of BMP will be paid
524 on a lump sum basis. Measurement for payment will not apply.
525

526 **(B)** The Engineer will only measure additional water pollution, dust and
527 erosion control required and requested by the Engineer on a force account
528 basis in accordance with Subsection 109.06 – Force Account Provisions and
529 Compensation.
530

531 **209.05 Payment.** The Engineer will pay for accepted pay items listed below at
532 contract price per pay unit, as shown in the proposal schedule. Payment will be full
533 compensation for work prescribed in this section and contract documents.
534

535 The Engineer will pay for each of the following pay items when included in
536 proposal schedule:
537

538 Pay Item	539 Pay Unit
540 Installation, Maintenance, Monitoring, and Removal of BMP	541 Lump Sum
542 Additional Water Pollution, Dust, and Erosion Control	543 Force Account

544 An estimated amount for force account is allocated in proposal schedule
545 under 'Additional Water Pollution, Dust, and Erosion Control', but actual amount to
546 be paid will be the sum shown on accepted force account records, whether this sum
547 be more or less than estimated amount allocated in proposal schedule. The
548 Engineer will pay for BMP measures requested by the Engineer that are beyond
549 scope of accepted Site-Specific BMP on a force account basis.

550
551 No progress payment will be authorized until the Engineer accepts in writing
552 Site-Specific BMP or when the Contractor fails to maintain project site in accordance
553 with accepted BMP.

554
555 For all citations or fines received by the Department for non-compliance,
556 including compliance with NPDES Permit conditions, the Contractor shall reimburse
557 State within 30 calendar days for full amount of outstanding cost State has incurred,
558 or the Engineer will deduct cost from progress payment.

559
560 The Engineer will assess liquidated damages up to \$27,500 per day for non-
561 compliance of each BMP requirement and all other requirements in this section.
562

563 **Appendix A**

564

565 The following list identifies potential pollutant sources and corresponding
566 BMPs used to mitigate the pollutants. Each BMP is referenced to the corresponding
567 section of the current HDOT Construction Best Management Practices Field Manual
568 or appropriate Supplemental Sheets. The Manual may be obtained from the HDOT
569 Statewide Stormwater Management Program Website at
570 <http://www.stormwaterhawaii.com/resources/contractors-and-consultants/> under
571 Construction Best Management Practices Field Manual. Supplemental BMP sheets
572 are located at <http://www.stormwaterhawaii.com/resources/contractors-and-consultants/storm-water-pollution-prevention-plan-swppp/> under Concrete Curing
573 and Irrigation Water.
574
575

Pollutant Source	Appropriate Site-Specific BMP to be Implemented	BMP Requirements
<p>Construction debris, green waste, general litter</p>	<ul style="list-style-type: none"> • Separate contaminated clean up materials from construction and demolition (C&D) wastes. • Provide waste containers (e.g., dumpster or trash receptacle) of sufficient size and number to contain construction and domestic wastes. • Inspect construction waste and recycling areas regularly. • Schedule solid waste collection regularly. • Schedule recycling activities based on construction/demolition phases. • Empty waste containers weekly or when they are two-thirds full, whichever is sooner. • Do not allow containers to overflow. Clean up immediately if they do. • On work days, clean up and dispose of waste in designated waste containers. • See Solid Waste Management Section SM-6 for additional requirements. • Provide Storm Drain Inlet Protection and/or Perimeter Sediment Controls as applicable. • <i>Collect and dispose of all waste materials in trash dumpsters. Place dumpsters, with secure watertight lids, away from storm water conveyances and drains, in a covered materials storage area.</i> • <i>Dispose of construction and non- construction solid waste in accordance with State DOH regs.</i> • <i>Load removed non- recyclable vegetation directly onto trucks; cover and transport to a licensed facility</i> 	<p>See Solid Waste Management Section SM-6. <i>Storm Drain Inlet Protection SC-1, and Perimeter Sediment Controls where applicable.</i></p>

Pollutant Source	Appropriate Site-Specific BMP to be Implemented	BMP Requirements
<p>Materials associated with the operation and maintenance of equipment, such as oil, fuel, and hydraulic fluid leakage</p>	<ul style="list-style-type: none"> • Use off-site wash racks, repair and maintenance facilities, and fueling sites when practical. • Designate bermed wash area if cleaning on site is necessary. • Place drip pans or drop cloths under vehicles and equipment to absorb spills or leaks. • Provide an ample supply of readily available spill cleanup materials. • Clean up spills immediately, using dry cleanup methods where possible, and dispose of used materials properly. • Do not clean surfaces or spills by hosing the area down. • Eliminate the source of the spill to prevent a discharge or a continuation of an ongoing discharge. • Inspect on-site vehicles and equipment regularly and immediately repair leaks. • Regularly inspect fueling areas and storage tanks. • Train employees on proper maintenance and spill practices and procedures and fueling and cleanup procedures. • Store diesel fuel, oil, hydraulic fluid, or other petroleum products or other chemicals in water-tight containers and provide cover or secondary containment. • Do not remove original product labels and comply with manufacturer's labels for proper disposal. • Dispose of containers only after all the product has been used. • Dispose of or recycle oil or oily wastes according to Federal, State, and Local requirements. • Store soaps, detergents, or solvents under cover or other means to prevent contact with rainwater. • See Vehicle and Equipment Cleaning, Maintenance, and Refueling, Sections SM-11, SM-12, and SM-13 and Material Storage and Handling Section SM-2 for additional requirements. 	<p>See Vehicle and Equipment Cleaning, Maintenance, and Refueling, Sections SM-11, SM-12, and SM-13, and Material Storage and Handling, Section SM-2, and Spill Prevention and Control SM-10.</p>

Pollutant Source	Appropriate Site-Specific BMP to be Implemented	BMP Requirements
Soil erosion from the disturbed areas	<ul style="list-style-type: none"> • Provide Soil Stabilization, Slope Protection, Storm Drain Inlet Protection SC-1, Perimeter Controls and Sediment Barriers, Sediment Basins and Detention Ponds, Check Dams SC-3 ,Level Spreader EC-6, Paving Operations SM-20, Construction Roads and Parking Area Stabilization SC-10, Controlling Storm Water Flowing Onto and Through the Project, Post-Construction BMPs, and Non-Structural BMPs (Construction BMP Training SM-1, Scheduling SM-14, Location of Potential Sources of Sediment SM-15, Preservation of Existing Vegetation SM-17). • Delineate, and clearly mark off, with flags, tape, or other similar marking device all natural buffer areas defined in the SWPPP. • Preserve native topsoil where practicable. • In areas where vegetative stabilization will occur, restrict vehicle/equipment use in areas to avoid soil compaction or condition soil to promote vegetative growth. • For Storm Drain Inlet Protection, clean, or remove and replace, the protection measures as sediment accumulates, the filter becomes clogged, and/or performance is compromised. • Where there is evidence of sediment accumulation adjacent to the inlet protection measure, remove the deposited sediment by the end of the same day in which it is found or by the end of the following work day if removal by the same day is not feasible. • Sediment basins shall be designed and maintained in accordance with HAR Chapter 11-55. • Minimize disturbance on steep slopes (Greater than 15% in grade). • If disturbance of steep slopes are unavoidable, phase disturbances and use stabilization techniques designed for steep grades. • For temporary drains and swales use velocity dissipation devices within and at the outlet to minimize erosive flow velocities. 	<p>Soil Stabilization</p> <ol style="list-style-type: none"> 1. SM-22 Topsoil Management 2. EC-12 Seeding and Planting 3. EC-14 Mulching 4. EC-11 Geotextiles and Mats <p>Slope Protection</p> <ol style="list-style-type: none"> 1. EC-12 Seeding and Planting 2. EC-14 Mulching 3. EC-11 Geotextiles and Mats 4. EC-4 Slope Roughening, Terracing, and Rounding 5. EC-7 Slope Drains and Subsurface Drains 6. EC-9 Slope Interceptor or Diversion Ditches/Berms <p>SC-1 Storm Drain Inlet Protection</p>

Pollutant Source	Appropriate Site-Specific BMP to be Implemented	BMP Requirements
		<p><i>Perimeter Controls and Sediment Barriers</i></p> <ol style="list-style-type: none"> 1. SC-7 Silt Fence <i>or Filter Fabric Fence</i> 2. SC-2 Vegetated Filter Strips and Buffers 3. SC-6 Compost Filter Berm/Sock 4. SC-8 Sandbag Barrier 5. SC-9 Brush or Rock Filter <p><i>Sediment Basins and Detention Ponds</i></p> <ol style="list-style-type: none"> 1. SC-4 Sediment Trap 2. SC-5 Sediment Basin <p>SC-3 Check Dams</p> <p>EC-6 Level Spreader SM-20 Paving Operations SC-10 Construction Roads and Parking Area Stabilization</p>

Pollutant Source	Appropriate Site-Specific BMP to be Implemented	BMP Requirements
		<p>Controlling Storm Water Flowing onto and Through the Project</p> <ol style="list-style-type: none"> 1. EC-3 Run-On Diversion 2. EC-5 Earth Dike, Swales and Ditches <p>Post Construction BMPs</p> <ol style="list-style-type: none"> 1. EC-2 Flared Culvert End Sections 2. EC-10 Rip-Rap and Gabion Inflow Protection 3. EC-8 Outlet Protection and Velocity Dissipation Devices 4. SM-22 Topsoil Management <p>Non-Structural BMPs</p> <ol style="list-style-type: none"> 1. SM-1 Construction BMP Training 2. SM-14 Scheduling 3. SM-15 Location of Potential Sources of Sediment 4. SM-17 Preservation of Existing Vegetation

Pollutant Source	Appropriate Site-Specific BMP to be Implemented	BMP Requirements
Sediment from soil stockpiles	<ul style="list-style-type: none"> • Locate stockpiles a minimum of 50 feet or as far as practicable from concentrated runoff or outside of any natural buffers identified on the SWPPP. • Place bagged materials on pallets and under cover. • Provide physical diversion to protect stockpiles from concentrated runoff. • Cover stockpiles with plastic or comparable material when practicable. • Place silt fence, fiber filtration tubes, or straw wattles around stockpiles. • Do not hose down or sweep soil or sediment accumulated on pavement or other impervious surfaces into any storm water conveyance (unless connected to a sediment basin, sediment trap, or similarly effective control), storm drain inlet, or state water. • Unless infeasible, contain and securely protect stockpiles from the wind. • Provide Storm Drain Inlet Protection and/or Perimeter Sediment Controls as applicable. See Stockpile Management Section SM-3 for additional requirements. 	See Stockpile Management Section SM-3. Storm Drain Inlet Protection SC-1, and Perimeter Sediment Controls where applicable.
Emulsified asphalt or prime/tack coat	<ul style="list-style-type: none"> • Provide training for employees and contractors on proper material delivery and storage practices and procedures. • Restrict paving operations during wet weather to prevent paving materials from being discharged. • Use asphalt emulsions such as prime coat when possible. • Protect drain inlet structures and manholes during application of tack coat, seal coat, slurry seal, and fog seal. • Keep ample supplies of drip pans and absorbent materials on site. • Inspect inlet protection devices. • See Material Storage and Handling Section SM-2 and Paving Operations Section SM-20 for additional requirements. • Provide Storm Drain Inlet Protection and/or Perimeter Sediment Controls as applicable. 	See Material Storage and Handling Section SM-2, and Stockpile Management Section SM-3, Paving Operations Section SM-20, Storm Drain Inlet Protection SC-1, and Perimeter Sediment Controls where applicable.

Pollutant Source	Appropriate Site-Specific BMP to be Implemented	BMP Requirements
<p>Materials associated with painting, such as paint and paint wash solvent</p>	<ul style="list-style-type: none"> • Hazardous chemicals shall be well-labeled and stored in original containers. • Keep ample supply of cleanup materials on site. • Dispose container only after all of the product has been used. • Remove as much paint from brushes on painted surface. • Rinse from water-based paints shall be discharged into the sanitary sewer system where possible. If not, direct all washwater into a leak-proof container or leak-proof pit. The container or pit must be designed so that no overflows can occur due to inadequate sizing or precipitation. • Locate on-site wash area a minimum of 50 feet away or as far as practicable from storm drain inlets, open drainage facilities, or water bodies. • Do not dump liquid wastes into the storm drainage system. • Filter and re-use solvents and thinners. • Dispose of oil-based paints and residue as a hazardous waste. • Ensure collection, removal, and disposal of hazardous waste complies with regulations. • Immediately clean up spills and leaks. • Properly store paints, solvents, and epoxy compounds. • Properly store and dispose waste materials generated from painting and structure repair and construction activities. • Mix paints in a covered and contained area, when possible, to minimize adverse impacts from spills. • Do not apply traffic paint or thermoplastic if rain is forecasted. • See Material Storage and Handling Use SM-2, Hazardous Materials and Waste Management Section SM-9, Spill Prevention and Control Section SM-10, and Structure Construction and Painting Section SM-21 for additional requirements. <p>Provide Storm Drain Inlet Protection and/or Perimeter Sediment Controls as applicable.</p>	<p>See Material Storage and Handling Use Section SM-2, Stockpile Management Section SM-3, Hazardous Materials and Waste Management Section SM-9, Waste Management, Spill Prevention and Control Section SM-10, and Structure Construction and Painting Section SM-21, Storm Drain Inlet Protection SC-1, and Perimeter Sediment Controls where applicable.</p>

Pollutant Source	Appropriate Site-Specific BMP to be Implemented	BMP Requirements
<p><i>Industrial chemicals, fertilizers, and/or pesticides</i></p>	<ul style="list-style-type: none"> • <i>Hazardous chemicals shall be well-labeled and stored in original containers.</i> • <i>Keep ample supply of cleanup materials on site.</i> • <i>Clean up spills immediately, using dry clean-up methods where possible, and dispose of used materials properly.</i> • <i>Do not clean surfaces or spills by hosing the area down.</i> • <i>Eliminate the source of the spill to prevent a discharge or a furtherance of an ongoing discharge.</i> • <i>Dispose container only after all of the product has been used.</i> • <i>Retain a complete set of safety data sheets (formerly MSDS) on site.</i> • <i>Store industrial chemicals in water-tight containers and provide either cover or secondary containment.</i> • <i>Provide cover when storing fertilizers or pesticides to prevent these chemicals from coming into contact with rainwater.</i> • <i>Restrict amount of pesticide prepared to quantity necessary for the current application.</i> • <i>Do not apply fertilizers or pesticides during or just before a rain event.</i> • <i>Do not apply to stormwater conveyance channels with flowing water.</i> • <i>Comply with fertilizer and pesticide manufacturer's recommended usage and disposal instructions. Document departures from manufacturer's specifications in Attachment J.</i> • <i>Apply fertilizers at the appropriate time of year for the location, and preferably timed to coincide as closely as possible to the period of maximum vegetation uptake and growth.</i> • <i>Follow federal, state, and local laws regarding fertilizer application.</i> • <i>Do not dispose of toxic liquid wastes (solvents, used oils, and paints) or chemicals (additives, acids, and curing compounds) in dumpsters allocated for construction debris.</i> 	<p>See Material Storage and Handling Use Section SM-2, Stockpile Management Section SM-3, and Hazardous Materials and Waste Management Section SM-9, and Spill Prevention and Control SM-10</p>

Pollutant Source	Appropriate Site-Specific BMP to be Implemented	BMP Requirements
	<ul style="list-style-type: none"> • Ensure collection, removal, and disposal of hazardous waste complies with regulations. Hazardous waste that cannot be reused or recycled shall be disposed of by a licensed hazardous waste hauler. See Material Storage and Handling Use SM-2, and Hazardous Materials and Waste Management Section SM-9 for additional requirements. 	
<p>Hazardous waste (Batteries, Solvents, Treated Lumber, etc.)</p>	<ul style="list-style-type: none"> • Do not dispose of toxic materials in dumpsters allocated for construction debris. • Ensure collection, removal, and disposal of hazardous waste complies with regulations. • Hazardous waste that cannot be reused or recycled shall be disposed of by a licensed hazardous waste hauler. • Segregate and recycle wastes from vehicle/equipment maintenance activities such as used oil or oil filters, greases, cleaning solutions, antifreeze, automotive batteries, and hydraulic and transmission fluids. • Store waste in sealed containers, which are constructed of suitable materials to prevent leakage and corrosion, and which are labeled in accordance with applicable Resource Conservation and Recovery Act (RCRA) requirements and all other applicable federal, state, and local requirements. • All containers stored outside shall be kept away from surface waters and within appropriately sized secondary containment (e.g., spill berms, decks, spill containment pallets). Provide cover if possible. • Clean up spills immediately, using dry clean-up methods where possible, and dispose of used materials properly. • Do not clean surfaces or spills by hosing the area down. • Eliminate the source of the spill to prevent a discharge or a continuation of an ongoing discharge. 	<p>See Hazardous Materials and Waste Management Section SM-9 and Vehicle and Equipment Maintenance SM-12</p>

Pollutant Source	Appropriate Site-Specific BMP to be Implemented	BMP Requirements
	<ul style="list-style-type: none"> • Ensure collection, removal, and disposal of hazardous waste complies with manufacturer's recommendations and is in compliance with federal, state, and local requirements. • See Hazardous Materials and Waste Management Section SM-9 and Vehicle and Equipment Management, Vehicle and Equipment Maintenance SM-12 for additional requirements. 	
Metals and Building Materials	<ul style="list-style-type: none"> • Inspect construction waste and recycling areas regularly. • Schedule solid waste collection regularly. • If building materials or metals are stored on site (such as rebar or galvanized poles) store under cover under tarps or in containers. • Minimize the amount of material stored on site. • Do not stockpile uncovered metals or other building materials in close proximity to discharge points. • See Solid Waste Management Section SM-6 for additional requirements. 	See Solid Waste Management Section SM-6
Contaminated Soil	<ul style="list-style-type: none"> • See Waste Management, Contaminated Soil Management Section SM-8 and/or Hazardous Materials and Waste Management Section SM-9 for additional requirements. • At minimum contain contaminated material soil by surrounding with impermeable lined berms or cover exposed contaminated material with plastic sheets. 	See Waste Management, Contaminated Soil Management Section SM-8 and/or Hazardous Materials and Waste Management Section SM-9

Pollutant Source	Appropriate Site-Specific BMP to be Implemented	BMP Requirements
<i>Fugitive Dust Control and Dust Control Water</i>	<ul style="list-style-type: none"> • Do not over spray water for dust control purposes which will result in runoff from the area. • Apply water as conditions require. • Washing down of debris or dirt into drainage, sewage systems, or State waters is not allowed. • <i>Minimize exposed areas through the schedule of construction activities.</i> • <i>Utilize vegetation, mulching, sprinkling, and stone/gravel layering to quickly stabilize exposed soil.</i> • <i>Direct construction vehicle traffic to stabilized roadways.</i> • <i>Cover dump trucks hauling material from the site with a tarpaulin.</i> <p>See Dust Control Section SM-19 for additional requirements.</p>	See Dust Control Section SM-19
<i>Concrete Truck Wash Water</i>	<ul style="list-style-type: none"> • Disposal of concrete truck wash water via percolation is prohibited. • Wash concrete-coated vehicles or equipment off-site or in the designated wash area. • Locate on-site wash area a minimum of 50 feet away or as far as practicable from storm drain inlets, open drainage facilities, or water bodies. • Runoff from the on-site concrete wash area shall be contained in a temporary pit or level bermed area where the concrete can set. • Design the area so that no overflow can occur due to inadequate wash area sizing or precipitation. • The temporary pit shall be lined with plastic to prevent seepage of wash water into the ground. • Allow wash water to evaporate or collect wash water and all concrete debris in a concrete washout system bin. • Do not dump liquid wastes into storm drainage system. • Dispose of liquid and solid concrete wastes in compliance with federal, state, and local standards. • See Waste Management, Concrete <i>Wash and Waste Management</i> Section SM-4 for additional requirements. 	See Waste Management, Concrete <i>Wash and Waste Management</i> Section SM-4

Pollutant Source	Appropriate Site-Specific BMP to be Implemented	BMP Requirements
Sediment Track-Out	<ul style="list-style-type: none"> • <i>Include Stabilized Construction Entrance at all points that exit onto paved roads.</i> • <i>A sediment trapping device is required if a wash rack is used in conjunction with the stabilized construction entrance/exit.</i> • <i>The pavement shall not be cleaned by washing down the street.</i> • <i>If sweeping is ineffective or it is necessary to wash the streets, wash water must be contained either by construction of a sump, diverting the water to an acceptable disposal area, or vacuuming the wash water.</i> • <i>Use BMPs for adjacent drainage structures.</i> • <i>Remove sediment tracked onto the street by the end of the day in which the track-out occurs.</i> • <i>Restrict vehicle use to properly designated exit points.</i> • <i>Include additional BMPs that remove sediment prior to exit when minimum dimensions cannot be met.</i> <p><i>See Stabilized Construction Entrance/Exit Section SC-11 for additional requirements.</i></p>	See Stabilized Construction Entrance/Exit Section SC-11
Irrigation Water	<ul style="list-style-type: none"> • <i>Consider irrigation requirements.</i> • <i>Where possible, avoid species which require irrigation.</i> • <i>Design, timing and application methods of irrigation water to eliminate the runoff of excess irrigation water into the storm water drainage system.</i> <p><i>See Seeding and Planting Section EC-12 and California Stormwater BMP Handbook SD-12 Efficient Irrigation included in SWPPP Attachment A for additional requirements.</i></p>	See Seeding and Planting Section EC-12 and California Stormwater BMP Handbook SD-12 Efficient Irrigation
Hydrotesting Effluent	<ul style="list-style-type: none"> • <i>If work includes removing, relocation or installing waterlines, and Contractor elects to flush waterline or discharge hydrotesting effluent into State waters or drainage systems, the Contractor shall prepare and obtain HDOT acceptance of a NOI/NPDES Permit Form F application for HDOT submittal to DOH CWB at least 30 calendar days prior to the start of Hydrotesting Activities if necessary. Site specific BMPs will be included in the NOI/NPDES Permit Form F submittal.</i> 	Site specific BMPs will be included in the NOI/NPDES Permit Form F submittal.

Pollutant Source	Appropriate Site-Specific BMP to be Implemented	BMP Requirements
<i>Dewatering Effluent</i>	<i>If excavation or backfilling operations require dewatering, and Contractor elects to discharge dewatering effluent into State waters or existing drainage systems, Contractor shall prepare and obtain HDOT acceptance of a NOI/NPDES Permit Form G application for HDOT submittal to DOH CWB at least 30 calendar days prior to the start of Dewatering Activities if necessary. See Site Planning and General Practices, Dewatering Operations Section SM-18 for additional requirements.</i>	<i>See Dewatering Operations SM-18. Site specific BMPs will be included in the NOI/NPDES Permit Form G submittal.</i>
<i>Saw-cutting Slurry</i>	<ul style="list-style-type: none"> • <i>Saw cut slurry shall be removed from the site by vacuuming.</i> • <i>Provide storm drain protection during saw cutting. See Paving Operations Section SM-20 for additional requirements.</i> <i>Provide Storm Drain Inlet Protection and/or Perimeter Sediment Controls as applicable.</i>	<i>See Paving Operations Section SM-20, Storm Drain Inlet Protection SC-1, Perimeter sediment controls where applicable</i>
<i>Concrete Curing Water</i>	<ul style="list-style-type: none"> • <i>Avoid overspraying of curing compounds.</i> • <i>Apply an amount of compound that covers the surface, but does not allow any runoff of the compound.</i> <i>See California Stormwater BMP Handbook NS-12 Concrete Curing included in SWPPP Attachment A for additional requirements.</i>	<i>See California Stormwater BMP Handbook NS-12 Concrete Curing</i>

Pollutant Source	Appropriate Site-Specific BMP to be Implemented	BMP Requirements
Plaster Waste Water	<ul style="list-style-type: none"> • Direct all wastewater into a leak-proof container or leak-proof pit. The container or pit must be designed so that no overflows can occur due to inadequate sizing or precipitation. • Locate on-site wash area a minimum of 50 feet away or as far as practicable from storm drain inlets, open drainage facilities, or water bodies. • Any significant residual materials remaining on the ground after the completion of construction shall be removed and properly disposed. If the residual materials contaminate the soil, then the contaminated soil shall also be removed and properly disposed of. • Plaster waste water shall not be allowed to flow into drainage structures or State waters. See Material, Storage and Handling Use SM-2, Stockpile Management Use Section SM-3, and Hazardous Materials and Waste Management Section SM-9 for additional requirements. 	See Material, Storage and Handling Use Section SM-2, Stockpile Management Use Section SM-3, and Hazardous Materials and Waste Management Section SM-9
Water-Jet Wash Water	<ul style="list-style-type: none"> • For Water-Jet Wash Water used to clean vehicles, use off site wash racks or commercial washing facilities when practical. • See Vehicle and Equipment Cleaning Section SM-11 for additional information. • For Water-Jet Wash Water used to clean impervious surfaces, the runoff shall not be allowed to flow into drainage structures or State Waters. 	See Vehicle and Equipment Cleaning Section SM-11
Sanitary/Septic Waste	<ul style="list-style-type: none"> • Locate Sanitary facilities in a convenient place away from drainage facilities. • Position sanitary facilities so they are secure and will not be tipped over or knocked down. • Wastewater shall not be discharged to the ground or buried. • A licensed service provider shall maintain sanitary/septic facilities in good working order. • Schedule regular waste collection by a licensed transporter. • See Sanitary Waste Section SM-7 for additional requirements. 	See Sanitary Waste Section SM-7.

591
592
593

“

END OF SECTION 209

**7101A-01-20
209-28a**

04/19/22

1 **SECTION 301 – HOT MIX ASPHALT BASE COURSE**

2
3 Make the following amendments to said Sections:

4
5 **(I)** Amend **Section 301.03(B) Compaction** by revising the second
6 paragraph from lines 84 to 87 to read as follows:

7
8 “Compact mixture immediately upon completion of spreading
9 operations to density of not less than 92.0 percent of maximum theoretical
10 specific gravity in accordance with AASHTO T 209, modified by deletion of
11 Supplemental Procedure for Mixtures Containing Porous Aggregate.”

12
13
14 **(II)** Amend **Section 301.04 Measurement** from lines 98 to 100 to read as
15 follows:

16
17 **“301.04 Measurement.**

18
19 **(A)** The Engineer will measure HMAB course per ton in accordance
20 with contract documents.”

21
22
23 **(III)** Amend **Section 301.05 Payment**, from lines 102 to 111 to read as
24 follows:

25
26 **“301.05 Payment.** The Engineer will pay for the accepted pay items
27 listed below at the contract price per pay unit, as shown in the proposal schedule.
28 Payment will be full compensation for the work prescribed in this section and the
29 contract documents.

30
31 The Engineer will pay for one of the following pay items when included in
32 the proposal schedule:

33

	Pay Item	Pay Unit
34		
35		
36	(A) Hot Mix Asphalt Base Course	Ton
37		
38	(1) 80% of the contract unit price upon completion of submitting	
39	a job-mix formula acceptable to the Engineer; preparing the	
40	surface, spreading, and finishing the mixture; and compacting the	
41	mixture by rolling;	
42		
43	(2) 20% of the contract unit price upon completion of cutting	
44	samples from the compacted pavement for testing; placing and	
45	compacting the sampled area with new material conforming to the	
46	surrounding area; protecting the pavement; and final analysis.	

47
48
49
50
51
52
53

The Engineer may, in lieu of requiring removal and replacement, use the sliding scale factor to accept HMAB compacted below 92.0 percent. The Engineer will make payment for the material in that production day at a reduced price arrived at by multiplying the contract unit price by the pay factor shown in Table 301.05-1.

Table 301.05-1 – Sliding Scale Pay Factor	
Percent Compaction	Percent Payment
92.0 or greater	100
90.0 to less than 92.0	80
<90.0	Removal

54
55
56
57

END OF SECTION 301

1 **SECTION 304 – AGGREGATE BASE COURSE**
2

3 Make the following amendments to said Section:
4

5 **(I)** Amend **304.04 – Measurement** by revising lines 54 to 55 to read as
6 follows:

7
8 **“304.04 Measurement.**
9

10 **(A)** The Engineer will measure aggregate base per cubic yard in
11 accordance with the contract documents.”
12

13 **(II)** Amend **304.05 – Payment** by revising lines 57 to 66 to read as follows:
14

15 **“304.05 Payment.** The Engineer will pay for the accepted aggregate base
16 at the contract price per pay unit, as shown in the proposal schedule. Payment
17 will be full compensation for the work prescribed in this section and the contract
18 documents.
19

20 The Engineer will pay for the following pay item when included in the
21 proposal schedule:
22

Pay Item	Pay Unit
Aggregate Base	Cubic Yard”

26
27
28
29
30
END OF SECTION 304

1 **SECTION 305 – AGGREGATE SUBBASE COURSE**

2
3 Make the following amendments to said Section:

4
5 **(I)** Amend **305.04 – Measurement** by revising lines 54 to 55 to read as
6 follows:

7
8 **“305.04 Measurement.**

9
10 **(A)** The Engineer will measure aggregate subbase per cubic yard in
11 accordance with the contract documents.”

12
13 **(II)** Amend **305.05 – Payment** by revising lines 57 to 66 to read as follows:

14
15 **“305.05 Payment.** The Engineer will pay for the accepted aggregate
16 subbase at the contract price per pay unit, as shown in the proposal schedule.
17 Payment will be full compensation for the work prescribed in this section and the
18 contract documents.

19
20 The Engineer will pay for the following pay item when included in the
21 proposal schedule:

22

Pay Item	Pay Unit
Aggregate Subbase	Cubic Yard”

23
24
25
26
27
28
29

30 **END OF SECTION 305**

1 **Amend Section 401 – HOT MIX ASPHALT (HMA) PAVEMENT to read as**
2 **follows:**

3
4 **“SECTION 401 – HOT MIX ASPHALT (HMA) PAVEMENT**

5
6 **401.01 Description.** This section describes furnishing and placing dense graded
7 HMA pavement (herein referred to as HMA) on a prepared surface.

8
9 **401.02 Materials.**

10
11 Asphalt Cement (PG 64-16) 702.01(A)

12
13 Use for non-surface mixes, unless otherwise specified in the project documents.

14
15 Asphalt Cement (PG 64E-22) 702.01(B)

16
17 Use for all surface mixes, except for on Lanai and Molokai, and unless otherwise
18 specified in the project documents. Polymer modified asphalt (PMA) pavement
19 refers to asphalt mix using PG 64E-22, unless otherwise indicated.

20
21 Emulsified Asphalt 702.04

22
23 Warm Mix Asphalt Additive 702.06

24
25 Aggregate for Hot Mix Asphalt Pavement 703.09

26
27 Filler 703.15

28
29 Hydrated Lime or a liquid anti-strip approved by the engineer 712.03

30
31 **(A) General.** HMA pavement shall be plant mixed and shall include
32 mixture of aggregate and asphalt binder and may include reclaimed asphalt
33 pavement (RAP) or filler, or both.

34
35 The manufacture of HMA may include warm mix asphalt (WMA)
36 processes in accordance with these specifications. WMA processes include
37 combinations of organic additives, chemical additives, and foaming.

38
39 HMA pavement shall include surface course and may include one or
40 more binder courses, depending on HMA pavement thickness indicated in
41 the contract documents.

42
43 RAP is defined as removed or reprocessed pavement materials
44 containing asphalt and aggregates. Process RAP by crushing until 100
45 percent of RAP passes 3/4-inch sieve. Size, grade uniformly, and combine
46 materials such that blend of RAP and aggregate material conforms to grading

47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65

requirements of Subsection 703.09 - Aggregate for Hot Mix Asphalt Pavement.

In surface and binder courses, aggregate for HMA may include RAP quantities up to 20 percent of total mix weight.

Quantity of filler material to correct deficiencies in aggregate gradation passing the No. 200 sieve shall not exceed 3 percent by weight of fine aggregates.

(B) Job-Mix Formula and Tests. Design job-mix formula in accordance with procedures contained in current edition of Asphalt Institute's *Mix Design Methods for Asphalt Concrete and Other Hot Mix Types*, Manual Series No. 2 (MS-2) for either Marshall Method or Hveem Method of Mix Design.

Limit compacted lift thickness and asphalt content of job-mix formula as specified in Table 401.02-1 - Limits of Compacted Lift Thickness and Asphalt Content.

TABLE 401.02-1 - LIMITS OF COMPACTED LIFT THICKNESS AND ASPHALT CONTENT				
MIX NO.	II	III	IV	V
Minimum to Maximum Compacted Thickness for Individual Lifts (Inches)	2-1/4 to 3	2 to 3	1-1/2 to 3	1-1/4 to 3
Asphalt Content Limits (Percent of Total Weight of Mix)	3.8 to 6.1	4.3 to 6.1	4.3 to 6.5	4.8 to 7.0

66
67
68
69
70
71
72
73
74

Asphalt content limits for porous aggregate may be exceeded only if it is requested ahead of placement and is reviewed then accepted in writing by the Engineer.

Meet job-mix formula design criteria specified in Table 401.02-2 - Job-Mix Design Criteria.

TABLE 401.02-2 - JOB-MIX FORMULA DESIGN CRITERIA	
Hveem Method Mix Criteria (AASHTO T 246 and AASHTO T 247)	
Stability, minimum	37
Air Voids (percent) ¹	3 - 5
Marshall Method Mix Criteria (AASHTO T 245)	
Compaction (number of blows each end of specimen)	75
Stability, minimum (pounds)	1,800
Flow (x 0.01 inch)	8 - 16
Air Voids (percent) ¹	3 - 5
Notes:	
1. Air Voids: AASHTO T 166 or AASHTO T 275; AASHTO T 209, AASHTO T 269.	

76
77
78
79
80

Minimum percent voids in mineral aggregates (VMA) of job-mix formula shall be as specified in Table 401.02-3 - Minimum Percent Voids in Mineral Aggregates (VMA).

TABLE 401.02-3 - MINIMUM PERCENT VOIDS IN MINERAL AGGREGATES (VMA)					
Nominal Maximum Particle Size, (Inches)	1-1/2	1	3/4	1/2	3/8
VMA, (percent) ¹	11.0	12.0	13.0	14.0	15.0
Notes:					
1. VMA: See Asphalt Institute Manual MS-2					

81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96

(C) Submittals. Establish and submit job-mix formula for each type of HMA pavement mix indicated in the contract documents a minimum of 30 days before paving production. Job mix shall include the following applicable information:

- (1) Design percent of aggregate passing each required sieve size.
- (2) Design percent of asphalt binder material (type determined by type of mix) added to the aggregate (expressed as % by weight of total mix),
- (3) Design proportion of processed RAP.
- (4) Design temperature of mixture at point of discharge at paver.

- 97 (5) Source of aggregate.
- 98
- 99 (6) Grade of asphalt binder.
- 100
- 101 (7) Test data used to develop job-mix formula.
- 102

103 Except for item (4) in this subsection, if design requirements are
 104 modified after the Engineer accepts job-mix formula, submit new job-mix
 105 formula before using HMA produced from modified mix design. Submit any
 106 changes to the design temperature of mixture at point of discharge for
 107 acceptance by the Engineer.

108

109 Submit a certificate of compliance for the asphalt binder, accompanied
 110 by substantiating test data from a certified testing laboratory.

111

112 **(D) Range of Tolerances for HMA.** Provide HMA within allowable
 113 tolerances of accepted job-mix formula as specified in Table 401.02-4 -
 114 Range of Tolerances These tolerances are not to be used for the design of
 115 the job mix, they are solely to be used during the testing of the production
 116 field sample of the HMA mix.

117

TABLE 401.02-4 - RANGE OF TOLERANCES HMA	
Passing No. 4 and larger sieves (percent)	± 7.0
Passing No. 8 to No. 100 sieves (inclusive) (percent)	± 4.0
Passing No. 200 sieve (percent)	± 3.0
Asphalt Content (percent)	± 0.4
Mixture Temperature (degrees F)	± 20

118

119 The tolerances shown are the allowable variance between the physical
 120 characteristics of laboratory job mix submitted mix design and the production
 121 or operational mix, i.e., field samples.

122

123 **401.03 Construction.**

124

125 **(A) Weather Limitations.** Placement of HMA shall not be allowed under
 126 the following conditions:

- 127
- 128 (1) On wet surfaces, e.g., surface with ponding or running water,
 129 surface that has aggregate or surface that appears beyond surface
 130 saturated dry, as determined by the Engineer.
- 131

132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172

(2) When air temperature is below 50 degrees F and falling. HMA may be applied when air temperature is above 40 degrees F and rising. Air temperature will be measured in shade and away from artificial heat.

(3) When weather conditions prevent proper method of construction.

(B) Equipment.

(1) **Mixing Plant.** Use mixing plants that conform to AASHTO M 156, supplemented as follows:

(a) All Plants.

1. Automated Controls. Control proportioning, mixing, and mix discharging automatically. When RAP is incorporated into mixture, provide positive controls for proportioning processed RAP.

2. Dust Collector. AASHTO M 156, Requirements for All Plants, Emission Controls is amended as follows:

Equip plant with dust collector. Dispose of collected material. In the case of baghouse dust collectors, dispose of collected material or return collected material uniformly.

3. Modifications for Processing RAP. When RAP is incorporated into mixture, modify mixing plant in accordance with plant manufacturer's recommendations to process RAP.

(b) Drum Dryer-Mixer Plants.

1. Bins. Provide separate bin in cold aggregate feeder for each individual aggregate stockpile in mix. Use bins of sufficient size to keep plant in continuous operation and of proper design to prevent overflow of material from one bin to another.

173
174
175
176
177
178
179
180
181
182
183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199
200
201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218

2. Stockpiling Procedures. Separate aggregate for Mix II, Mix III and Mix IV into at least three stockpiles with different gradations as follows: coarse, intermediate, and fine. Separate aggregates for Mix V into at least two stockpiles. Stockpile RAP separately from virgin aggregates.

3. Checking Aggregate Stockpile. Check condition of the aggregate stockpile often enough to ensure that the aggregate is in optimal condition.

(c) Batch and Continuous Mix Plants.

1. Hot Aggregate Bin. Provide bin with three or more separate compartments for storage of screened aggregate fractions to be combined for mix. Make partitions between compartments tight and of sufficient height to prevent spillage of aggregate from one compartment into another.

2. Load Cells. Calibrated load cells may be used in batch plants instead of scales.

(2) Hauling Equipment. Use trucks that have tight, clean, smooth metal beds for hauling HMA.

Thinly coat truck beds with a minimum quantity of non-stripping release agent to prevent mixture from adhering to beds. Diesel or petroleum-based liquid release agents, except for paraffin oil, shall not be used. Drain excess release agent from truck bed before loading with HMA.

Provide a designated clean up area for the haul trucks.

Equip each truck with a tarpaulin conforming to the following:

- (a)** In good condition, without tears and holes.
- (b)** Large enough to be stretched tightly over truck bed, completely covering mix. The tarpaulin shall be secured in such a manner that it remains stretched tightly over truck bed and HMA mix until the bed is about to be raised up in preparation for discharge.

(3) Asphalt Pavers. Use asphalt pavers that are:

219
220
221
222
223
224
225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260

- (a) Self-contained, power-propelled units.
- (b) Equipped with activated screed or strike-off assembly, heated if necessary.
- (c) Capable of spreading and finishing courses of HMA mixtures in lane widths applicable to typical section and thicknesses indicated in the contract documents.
- (d) Equipped with receiving hopper having sufficient capacity for uniform spreading operation.
- (e) Equipped with automatic feed controls to maintain uniform depth of material ahead of screed.
- (f) Equipped with automatic screed controls with sensors capable of sensing grade from outside reference line, sensing transverse slope of screed, and providing automatic signals to control screed grade and transverse slope.
- (g) Capable of operating at constant forward speeds consistent with satisfactory laying of mixture.
- (h) Equipped with a means of preventing the segregation of the coarse aggregate particles from the remainder of the bituminous plant mix when that mix is carried from the paver hopper back to the paver augers. The means and methods used shall be approved by the paver manufacturer and may consist of chain curtains, deflector plates, or other such devices and any combination of these.

The following specific requirements shall apply to the identified bituminous pavers:

1. **Blaw-Knox Bituminous Pavers.** Blaw-Knox bituminous pavers shall be equipped with the Blaw-Knox Materials Management Kit (MMK).
2. **Cedarapids Bituminous Pavers.** Cedarapids bituminous pavers shall be those that were manufactured in 1989 or later.

261
262
263
264
265
266
267
268
269
270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
292
293
294
295
296
297
298
299
300
301
302
303
304
305
306

3. Barber-Green/Caterpillar Bituminous Pavers.
Barber-Green/Caterpillar bituminous pavers shall be equipped with deflector plates as identified in the December 2000 Service Magazine entitled “New Asphalt Deflector Kit {6630, 6631, 6640}”.

Bituminous pavers not listed above shall have similar attachments or designs that shall make them equivalent to the bituminous pavers listed above. The Engineer will solely decide if it is equal to or better than the setups described for the equipment listed above.

Submit for review and acceptance, prior to the start of using the paver for the placing of plant mix, a full description in writing of the means and methods that will be used to prevent the bituminous paver from having both aggregate and temperature segregation. Use of any paver that has not been accepted is prohibited until acceptance of the paver is received from the Engineer. Any pavement placed with an unaccepted paver will be regarded as not compliant work and may not be paid for and may require removal.

Supply a Certificate of Compliance that verifies that the manufacturer’s approved means and methods used to prevent bituminous paver from having both aggregate and temperature segregation have been implemented on all pavers used on the project and are working in accordance with the manufacturer’s requirements and Contract Documents.

(4) Rollers. Rollers shall be self-propelled, steel-tired tandem, pneumatic-tired, or vibratory-type rollers capable of reversing without shoving or tearing the just placed HMA mixture. Provide sufficient number, sequencing, type, and rollers of sufficient weight to compact the mixture to required density while mixture is still in workable condition unless otherwise indicated. Equipment shall not excessively crush aggregate. Operate rollers in accordance with manufacturer’s recommendations and Contract Documents. The use of intelligent compaction is encouraged and may be required elsewhere in the Contract Documents.

(a) Steel-Tired Tandem Rollers. Steel-tired tandem rollers used for initial breakdown or intermediate roller passes shall have minimum gross weight of 12 tons and shall provide minimum 250-pound weight per linear inch of width on drive wheel.

307 Steel-tired tandem rollers used for finish roller passes
308 shall have minimum total gross weight of 3 tons.

309
310 Do not use roller with grooved or pitted rolling drum or
311 worn scrapers or wetting pads. Replace excessively worn
312 scrapers and wetting pads before use.

313
314 **(b) Pneumatic-Tired Rollers.** Pneumatic-tired rollers shall
315 be oscillating-type, equipped with smooth-tread pneumatic tires
316 of equal size and diameter. Maintain tire pressure within 5
317 pounds per square inch of designated operational pressure
318 when hot. Space tires so that gaps between adjacent tires are
319 covered by following set of tires.

320
321 Pneumatic-tired rollers used for breakdown or
322 intermediate roller passes shall have a ballast capable of
323 establishing an operating weight per tire of not less than 3,000
324 pounds. Equip rollers with tires having minimum 20-inch wheel
325 diameter with tires inflated to 70 to 75 pounds per square inch
326 pressure when cold and 90 pounds per square inch when hot.
327 Equip rollers with skirt-type devices to maintain temperature of
328 tires during rolling operations.

329
330 Pneumatic-tired rollers used for kneading finished
331 asphalt surfaces shall have a ballast capable of establishing an
332 operating weight per tire of not less than 1,500 pounds. Equip
333 rollers with tires having minimum 15-inch wheel diameter with
334 tires inflated to 50 to 60 pounds per square inch pressure. If
335 required, equip rollers with skirt-type devices to maintain
336 temperature of tires during rolling operations.

337
338 **(c) Vibratory Rollers.** Vibratory rollers shall be steel-tired
339 tandem rollers having minimum total weight of 3 tons. Equip
340 vibratory rollers with amplitude and frequency controls and
341 speedometer. Operate vibratory roller in accordance with
342 manufacturer's recommendations. For very thin lifts, 1 inch or
343 less in thickness, vibratory rollers shall not be used in the
344 vibratory mode. Instead, operate the unit in the static mode.

345
346 **(5) Hand Tools.** Keep hand tools used in production, hauling, and
347 placement of HMA clean and free of contaminants. Diesel or mineral
348 spirits or other cleaning material that is potentially deleterious to HMA
349 may be used to clean hand tools providing:

350
351 **(a)** It does not contaminate HMA with cleaning material.
352

353
354
355
356
357
358
359
360
361
362
363
364
365
366
367
368
369
370
371
372
373
374
375
376
377
378
379
380
381
382
383
384
385
386
387
388
389
390
391
392
393
394
395
396
397
398

(b) Clean hand tools over catch pan with capacity to hold all the cleaning material.

(c) Remove all diesel or mineral spirits or other cleaning material that is potentially deleterious to HMA from hand tools before using with HMA.

(d) Hand tools used shall be in a condition such that it meets the requirements that it was manufactured for, e.g., a straightedge shall meet the straightness requirement of the manufacturer.

(6) Material Transfer Vehicle (MTV).

(a) **Usage.** MTV usage applies to surface courses of paving projects on all Islands except Lanai, unless otherwise indicated. When placing HMA surface course use MTV to independently deliver mixtures from hauling equipment to paving equipment. MTV usage will not be required for the following:

1. Projects with less than 1,000 tons of HMA.
2. Temporary pavements.
3. Bridge deck approaches.
4. Shoulders.
5. Tapers.
6. Turning lanes.
7. Driveways.
8. Areas with low overhead clearances.

(b) **Equipment.** When using MTV, install minimum 10-ton-capacity hopper insert in conventional paver hopper. Provide the following equipment:

1. High-capacity truck unloading system in MTV capable of receiving HMA from hauling equipment.
2. MTV storage bin with minimum 15-ton capacity.
3. An auger mixing system in one of the following:

399
400
401
402
403
404
405
406
407
408
409
410
411
412
413
414
415
416
417
418
419
420
421
422
423
424
425
426
427
428
429
430
431
432
433
434
435
436
437
438
439
440
441
442
443

the MTV storage bin, or paver hopper insert, or paver hopper to continuously mix HMA prior to discharging to the paver's conveyor system.

Avoid stop-and-go operations by coordinating plant production rate, number of haul units, and MTV and paver speeds to provide a continuous, uniform, segregation-free material flow and smooth HMA pavement. Maintain uniform paver speed to produce smooth pavements.

(c) Performance Evaluation. Evaluate the performance of MTV and mixing equipment by measuring mat temperature profile immediately behind paver screed on first day of paving and when it feels the need to do so due to perceived changes in performance or as directed by the Engineer.

Use a hand-held temperature device that has been calibrated within the past 12 months. It shall be an infrared temperature gun is capable of measuring in one degree or finer increments between the temperatures of 80 degrees to 400 degrees F with a laser to indicate where the temperature reading is being taken. Six temperature profile measurements shall be taken of mat surface using infrared temperature gun at 50-foot intervals behind paver. Each temperature profile shall consist of three surface temperature measurements taken transversely across the mat in approximately a straight line from screed while paver is operating. For each profile, temperatures shall be measured approximately 1 foot from each edge and in middle of mat. The difference between maximum and minimum temperature measurements for each temperature profile shall not exceed 10 degrees F. If any two or more temperature profiles exceeds the allowable 10-degree F temperature differential, halt paving operation and adjust MTV or mixing equipment to ensure that material placed by paver meets specified temperature requirements. Redo the measuring of mat temperature profile until adjustment of the MTV or mixing equipment is adequate. Submit all temperature profiles to the Engineer by next business day. Information on the report shall show location and temperature readings and time test was performed. Enough information shall be given, so the Engineer will be able to easily locate the test site of the individual measurement.

When requested temperature profile measurements shall be done in the presence of the Engineer.

444 Once adjustments are made, repeat measurement
445 procedure for the next two placements to verify that material
446 placed by paver meets specified temperature requirements.
447 Terminate paving if temperature profile requirements are not
448 met during repeated measurement procedure. If equipment
449 fails to meet requirements after measurement procedure is
450 repeated once, replace equipment before conducting any
451 further temperature profile measurements
452

453 The Engineer may perform surface temperature profile
454 measurements at any time during project. The Engineer may
455 in lieu of a hand-held infrared temperature device use an
456 infrared camera or device that is capable of measuring
457 temperatures to locate cold spots. If such cold spots exist, the
458 Engineer may require adjustments to the MTV.
459

460 If bleeding or fat spots occur in the pavement adjust
461 means and methods to eliminate such pavement defects and
462 perform remedial repair to pavement acceptable to the
463 Engineer. Bleeding is defined as excess binder occurring on
464 the surface of the pavement. It may create a shiny, glass-like,
465 reflective appearance and may be tacky to the touch. Fat spots
466 are localized bleeding.
467

468 **(d) Transport.**
469

470 **1. Trailered MTV.** Transport MTV by means of
471 truck-tractor/trailer combination in accordance with
472 Chapter 104 of Title 19, Department of Transportation,
473 entitled "The Movement by Permit of Oversize and
474 Overweight Vehicles on State Highways".
475

476 **2. Crossing Bridges for Self-Powered MTV.**
477 When self-powered MTV exceeds legal axle or total
478 weight limits for vehicles under the HRS, Chapter 291,
479 conform to the following when crossing bridges within
480 project limits unless otherwise indicated:
481

- 482 **a.** Completely remove mix from MTV.
- 483
- 484 **b.** Move MTV at relatively constant speed not
485 exceeding 5 miles per hour. MTV will not be
486 allowed to stop on bridge.
487

488 c. No other vehicle or equipment will be
489 allowed on bridge.

490
491 d. The MTV shall not attempt to cross a
492 bridge where the posted load limit is less than or
493 equal to the weight of the MTV empty.
494 Permission to cross the bridge shall be obtained
495 from the Engineer and HWY-DB in writing.
496

497 **(C) Preparation of Surface.** Clean existing pavement in accordance with
498 Section 310 - Brooming Off. Apply tack coat in accordance with Section 407
499 - Tack Coat. Tack coat shall not be applied to surfaces to receive an
500 application of joint adhesive.
501

502 Where indicated, bring irregular surfaces to uniform grade and cross
503 section by furnishing and placing one or more leveling courses of HMA Mix
504 V. Spread leveling course in variable thicknesses to eliminate irregularities
505 in existing surface. Place leveling course such that maximum depth of each
506 course, when thoroughly compacted to the Contract Documents'
507 requirements, does not exceed 3 inches.
508

509 In multiple-lift leveling course construction, spread subsequent lifts
510 beyond edges of previously spread lifts in accordance with procedures
511 contained in current edition of the Asphalt Institute's *Construction of Hot Mix*
512 *Asphalt Pavements*, Manual Series No. 22 (MS-22) for leveling wedges.
513

514 Notify the Engineer of existing surfaces that may not be in a condition
515 that will have enough strength to be a good bonding surface or foundation
516 and should be removed or have remedial repairs done before new pavement
517 placement.
518

519 **(D) Plant Operation.**

520
521 **(1) Preparation of Asphalt Binder.** Uniformly heat asphalt binder
522 and provide continuous supply of heated asphalt cement from storage
523 to mixer. Do not heat asphalt binder above the recommendation of
524 the supplier for modified binders or above 350 degrees F for neat
525 binders.
526

527 **(2) Preparation of Aggregate.** Dry and heat aggregate material
528 at temperature sufficient to produce design temperature of job-mix
529 formula. Do not exceed 350 degrees F. Adjust heat source used for
530 drying and heating to avoid damage to and contamination of
531 aggregate. When dry, aggregate shall not contain more than 1
532 percent moisture by weight.

533 For batch plants, screen aggregates immediately after heating

534 and drying into three or more fractions. Convey aggregates into
535 separate compartments ready for batching and mixing with asphalt
536 binder.

537
538 **(3) Mixing.** Measure aggregate and asphalt; or aggregate, RAP,
539 and asphalt into mixer in accordance with an accepted job-mix
540 formula. Mix until components are completely mixed and adequately
541 coated with asphalt binder in accordance with AASHTO M 156.
542 Percent of coated particles shall be 95 percent when tested in
543 accordance with AASHTO T 195.

544
545 **(4) Plant Inspection.** For control and acceptance testing during
546 periods of production, provide a testing laboratory that meets the
547 requirements of AASHTO M 156. Provide space, utilities, and
548 equipment required for performing specified tests.

549
550 **(E) Spreading and Finishing.** Prior to each day's paving operation,
551 check screed or strike-off assembly surface with straight edge to ensure
552 straight alignment and there is no damage or wear to the machine that will
553 affect performance. Provide screed or strike-off assembly that produces
554 finished surface without tearing, shoving, and gouging HMA. Discontinue
555 using spreading equipment that leaves ridges, indentations, or other marks,
556 or combination thereof in surface that cannot be eliminated by rolling or
557 affects the final smoothness of the pavement or be prevented by adjustment
558 in operation.

559
560 Maintain HMA at minimum 250 degrees F temperature at discharge to
561 paver. The Engineer shall observe the contractor measuring the temperature
562 of mix in hauling vehicle just before depositing into spreader or paver or MTV.

563
564 Deposit HMA in a manner that minimizes segregation. Raise truck
565 beds with tailgates closed before discharging HMA.

566
567 Lay, spread, and strike off HMA upon prepared surface. Where
568 practical, use asphalt pavers to distribute mixture.

569
570 Where practical, control horizontal alignment using automatic grade
571 and slope controls from reference line, slope control device. Existing
572 pavements or features shall not be used for grade control alone.

573
574 Obtain sensor grade reference, horizontal alignment by using
575 established grade and slope controls. For subsequent passes, substitution
576 of one ski with joint-matching shoe riding on finished adjacent pavement is
577 acceptable. Use of a comparable non-contact mobile reference system and
578 joint matching shoe is acceptable.

579 Avoid stop-and-go operation. Maintain a constant forward speed of

580 paver during paving operation and minimize other methods that impact
581 smoothness.

582
583 Offset longitudinal joint in successive lifts by approximately 6 inches.
584 Incorporate into paving method an overlap of material of 1-inch +/- 0.5 inches
585 at the longitudinal joint. The HMA overlap material shall be left alone when
586 initially placed and shall not be bumped back or pushed back with a lute or
587 any other hand-held device. If the overlap exceeds the maximum amount,
588 remove the excess with a flat shovel, allowing recommended amount of
589 overlap HMA material to remain in place to be compacted. Do not throw the
590 removed excess HMA material on to the paving mat. The longitudinal joint
591 in a surface course when total roadway width is comprised of two lanes shall
592 be near the centerline of pavement or near lane lines when roadway is more
593 than two lanes in width. The longitudinal joint shall not be constructed in the
594 wheel path or under the longitudinal lane lines. Make a paving plan drawing
595 showing how the longitudinal joint will not be located in these areas.

596
597 Control the horizontal alignment of the longitudinal edge of the HMA
598 mat being installed so that the edge is parallel to the centerline or has a
599 uniform alignment, e.g., the edge of the mat is straight line or uniform curve,
600 no wavy edge, etc. to have a consistent amount of HMA material at the joint.

601
602 Check the compaction of the longitudinal joint during paving often
603 enough to ensure that it will meet the compaction requirements.

604
605 If nuclear gauges and ground penetrating radar are used as the
606 contractor's quality control method, they shall be properly calibrated and
607 periodically checked by comparison to cores taken from the pavement. The
608 use of sand as an aid in properly seating the gauge may also be considered
609 for improving the accuracy of the gauge.

610
611 In areas where irregularities or unavoidable obstacles make use of
612 mechanical spreading and finishing equipment impracticable, spread, rake,
613 and lute mixture by hand tools. For such areas, deposit, spread evenly, and
614 screed mixture to required compacted thickness.

615

616 Demonstrate competence of personnel operating grade and crown
617 control device before placing surface courses. If automatic control system
618 becomes inoperative during the day's work, the Engineer will permit the
619 Contractor to finish day's work using manual controls. The Engineer may
620 also allow additional HMA to be ordered and placed using manual controls if
621 it will provide a safer work site for the public to travel through. Do not resume
622 work until automatic control system is made operative. The Engineer may
623 waive requirement for electronic screed control device when paving gores,
624 shoulders, transitions, and miscellaneous reconstruction areas where the
625 use of the devices is not practical.

626
627 When production of HMA can be maintained and when practicable,
628 use pavers in echelon shall be used to place surface course in adjacent
629 lanes.

630
631 At the end of each workday, HMA pavement that is open to traffic shall
632 not extend beyond the panel of the adjacent new lane pavement by more
633 than the distance normally placed in one workday. At end of each day's
634 production, construct tapered transitions along all longitudinal and transverse
635 pavement drop-offs; this shall apply to areas where existing pavement is to
636 meet newly placed pavement. Use slopes of 6:1 for longitudinal taper
637 transitions and 48:1 for transverse tapered transitions. Maximum drop-off
638 height along the joints shall be 2 inches. Also, using a 48:1 slope provides a
639 taper around any protruding object, e.g., manholes, drain boxes, survey
640 monuments, inlets, etc., that may be above pavement surface when opened
641 to the public. If the object is below the surface of the pavement then fill the
642 depression until it is level with the surrounding pavement or raise depressed
643 objects to the finish grade of the placed pavement. Remove and dispose of
644 all transition tapers before placing adjoining panel or next layer of HMA.
645 Notify traveling public of pavement drop-offs or raised objects with signs
646 placed in every direction of traffic that may use and encounter pavement
647 drop-offs or protruding objects or holes.

648
649 Use the same taper rates for areas where there is a difference in
650 elevation due to construction work.

651
652 At end of each workweek, complete full width of the roadway's
653 pavement, including shoulders, to same elevation with no drop-offs.

654
655 **(F) Compaction.** Immediately after spreading and striking off HMA and
656 adjusting surface irregularities, uniformly compact mixture by rolling.

657
658 Initiate compaction at highest mix temperature allowing compaction
659 without excessive horizontal movement. Temperature shall not be less than
660 220 degrees F.

662 Finish rolling using tandem roller while HMA temperature is at or
663 above 175 degrees F.

664
665 On superelevated curves, begin rolling at lower edge and progress to
666 higher edge by overlapping of longitudinal trips parallel to centerline.

667
668 If necessary, repair damage immediately using rakes and fresh mix.
669 Do not displace line and grade of HMA edges during rolling.

670
671 Keep roller wheels properly moistened with water or water mixed with
672 small quantities of detergent. Use of excess liquid, diesel, and petroleum-
673 based liquids will not be allowed on rollers.

674
675 Along forms, curbs, headers, walls and other places not accessible to
676 rollers, compact mixture with hot hand tampers, smoothing irons, or
677 mechanical tampers. On depressed areas, trench roller or cleated
678 compression strips under roller may be used to transmit compression.

679
680 Before the start of compaction or during compaction or both remove
681 pavement that is loose, broken, or contaminated, or combination thereof;
682 pavement that shows an excess or deficiency in asphalt binder content; and
683 pavement that is defective in any way. Replace with fresh HMA pavement of
684 same type, and compact. Remove and replace defective pavement and
685 compact at no increase in contract price or contract time.

686
687 Operate rollers at slow and uniform speed with no sudden stops. The
688 drive wheels shall be nearest to the paver. Continue rolling to attain specified
689 density and until roller marks are eliminated.

690
691 Rollers shall not be parked on the pavement placed that day or shift.

692
693 **(1) HMA Pavement Courses One and a Half Inches Thick or**
694 **Greater.** Where HMA pavement compacted thickness indicated in the
695 Contract Documents is 1-1/2 inches or greater, compact to not less
696 than 93.0 percent nor greater than 97.0 percent of the maximum
697 specific gravity determined in accordance with AASHTO T 209,
698 modified by deletion of Supplemental Procedure for Mixtures
699 Containing Porous Aggregate.

700
701 Place HMA pavement in individual lifts that are within minimum
702 and maximum allowable compacted thickness for various types of
703 mixture as specified in Table 401.02-1 - Limits of Compacted Lift
704 Thickness and Asphalt Content.

705

706
707
708
709
710
711
712
713
714
715
716
717
718
719
720
721
722
723
724
725
726
727
728
729
730
731
732
733
734
735
736
737
738
739
740
741
742
743
744
745
746
747
748
749
750

(2) HMA Pavement Courses Less Than One and a Half Inches Thick. Where HMA pavement compacted thickness indicated in the contract documents is less than 1-1/2 inches, compaction to a specified density will not be required.

Use only non-vibratory, steel-tired, tandem roller. Roll entire surface with minimum of two roller passes. A roller pass is defined as one trip of the roller in one direction over any one spot.

For intermediate rolling, roll entire surface with minimum of four passes of roller.

Finish rolling using steel-tired, tandem roller. Continue rolling until entire surface has been compacted with minimum of three passes of roller, and roller marks have been eliminated.

Do not use rollers that will excessively crush aggregate.

(3) HMA Pavement Courses One and a Half Inches Thick or Greater In Special Areas Not Designated For Vehicular Traffic.

For areas such as bikeways that are not part of roadway and other areas not subjected to vehicular traffic, compact to not less than 90.0 percent of maximum specific gravity determined in accordance with AASHTO T 209, modified by deletion of Supplemental Procedure for Mixtures Containing Porous Aggregate. Increase asphalt content by at least 0.5 percent above that used for HMA pavements designed for vehicular traffic. Paved shoulders shall be compacted in the same manner as pavements designed for vehicular traffic.

(G) Joints, Trimming Edges and Utility Marking. At HMA pavement connections to existing pavements, make joints vertical to depth of new pavement. Saw cut existing pavement and cold plane in accordance with Section 415 - Cold Planing of Existing Pavement to depth equal to thickness of surface course or as indicated in the Contract Documents.

At HMA connections to previously placed lifts, form transverse joints by cutting back on previous run to expose full depth of course. Dispose of material trimmed from edges. Protect end of freshly laid mixture from rollers.

Before and after paving, identify and mark location of existing utility manholes, valves, and handholes on finished surface. Adjust existing frames and covers and valve boxes to final pavement finish grade in accordance with Section 604 - Manholes, Inlets and Catch Basins and Section 626 - Manholes and Valve Boxes for Water and Sewer Systems.

751 (1) Longitudinal joints. Submit for review the means and methods
752 that will be used to install longitudinal joints at the required compaction
753 and density. Compact longitudinal joints to be not less than 91.0
754 percent of the maximum specific gravity determined in accordance
755 with AASHTO T 209, modified by deletion of Supplemental Procedure
756 for Mixtures Containing Porous Aggregate. Verify the compaction of
757 the longitudinal joints meets requirements by using non-destructive
758 testing methods during paving and submit the results on the daily
759 quality control test reports.

760
761 Test for compaction and density regardless of layer thickness.
762 Compaction and density of the longitudinal joint shall be determined by using
763 six-inch diameter cores. For longitudinal joints made using butt joints cores
764 shall be taken over the joint with half of the core being on each side of the
765 joint. For longitudinal joints using butt wedge joints, center core over the
766 center of the wedge so that 50 percent of the material is from the most
767 recently paved material and the remaining 50 percent of the core is from the
768 material used to pave the previous layer. One core shall be taken at a
769 maximum of every 250 tons of longitudinal joint and any fraction of that length
770 for each day of paving with a minimum of one core taken for each longitudinal
771 joint per day. Cores taken for the testing of the longitudinal joint may be used
772 to determine pavement thickness.

773
774 When the longitudinal joints are found to have less than 91.0 percent
775 of the maximum specific gravity, overband all longitudinal joints within the
776 entire lot represented by the non-compliant core, PG binder seal coat, or
777 other type of joint enrichment accepted by the Engineer. The overband shall
778 not decrease the skid resistance of the pavement under any ambient weather
779 condition. Submit overband material's catalog cuts, test results and
780 application procedure for review and acceptance by the Engineer before use.
781 Center the overband over the longitudinal joint. The overband shall be placed
782 in a uniform width and horizontal alignment. The overband shall have no
783 holidays or streaking in its placement. The width of the overband shall be
784 based on how the longitudinal joint was constructed or as directed by the
785 Engineer. If a butt joint is used, the overband width shall be a minimum of
786 12-inches. For butt wedge or wedge joints the overband width shall be the
787 width of the wedge plus an additional six-inches minimum. Replace any
788 pavement markings damaged or soiled by the overband remedial repair
789 process.

790
791 For longitudinal joints that have a compaction of less than 89 percent
792 of the maximum specific gravity; removal may be required by the Engineer
793 instead of overbanding the non-compliant joint.

794
795 Persistent low compaction results may be cause to suspend work and
796 remove non-conforming work. During the suspension of paving, revise

797
798
799
800
801
802
803
804
805
806
807
808
809
810
811
812
813
814
815
816
817
818
819
820
821
822
823
824
825
826
827

means and methods used in constructing longitudinal joints and submit to the Engineer for review and acceptance. Suspension may occur when:

- (1) Two or more longitudinal joints tests fail to meet the minimum compaction
- (2) One sample reveals that the joint compaction is 89 percent or less.

Compaction results for longitudinal joints until January 1, 2023 will not be included in any Sliding Scale Pay Factor for Compaction payment calculation. After, January 1, 2023 it will be included.

(H) HMA Pavement Samples. Obtain test samples from compacted HMA pavement within 72 hours of lay down. Provide minimum 4-inch diameter cores consisting of undisturbed, full-depth portion of compacted mixture taken at locations designated by the Engineer in accordance with the “Sampling and Testing Guide for Acceptance and Verification” in Hawaii DOT Highways Division, *Quality Assurance Manual for Materials*, Appendix 3. Cores shall be taken in the presence of the Engineer. Turn cores over to Engineer immediately after cores have been taken.

For pavement samples for longitudinal joints provide 6-inch diameter cores minimum. For pavement samples for other than longitudinal joints 4-inch diameter cores minimum shall be taken. All cores shall consist of undisturbed, full-depth of the lift of the compacted mixture taken at locations designated by the Engineer in accordance with the “Sampling and Testing Guide for Acceptance and Verification” in Hawaii DOT Highways Division, *Quality Assurance Manual for Materials*, appendix 3. Coring of longitudinal joints shall use a modified HDOT Sampling and Testing Guide as required by the Contract Documents.

828 Cores that separate shall indicate to the Engineer that there is
829 insufficient bonding of layers. Modify the previously used paving means and
830 methods to prevent future debonding of layers. Debonding of a core sample
831 after adjustment of the Contractor's methods will be an indication of
832 continued non-conforming work and the Engineer may direct removal of the
833 layer at no additional cost or contract time.

834
835 Restore HMA pavement immediately after obtaining samples. Clean core
836 hole and walls of all deleterious material that will prevent the complete filling
837 of the core hole and the bonding of the new HMA to the existing. Apply tack
838 coat to vertical faces of sample holes. Fill sampled area with new HMA
839 pavement of same type as that removed. If hand compaction is used; fill in
840 layers not exceeding the minimum thickness stated in Table 401.02-1 - Limits
841 of Compacted Lift Thickness And Asphalt Content. Compact each layer to
842 compaction requirements. If Mechanical Compaction methods are used, then
843 layers may be the maximum layer thickness stated in Table 401.02-1 - Limits
844 of Compacted Lift Thickness And Asphalt Content. Using tires or hand
845 tamping to compact the HMA material to restore the pavement shall not be
846 considered as mechanical compaction.

847
848 Only sample and test leveling course if 1-1/2 inches or greater. No
849 compaction requirements for less than 1-1/2 inches.

850
851 **(I) HMA Pavement Thickness Tolerances.**

852
853 The Engineer will measure thickness of pavement by cores obtained
854 by the Contractor in accordance with HDOT TM 09-19 Field Sampling
855 Bituminous Material after Compaction (Obtaining Cores). The Engineer will
856 measure cores in accordance with HDOT TM 09-19, except that
857 measurement will be taken to nearest one thousandth of an inch; and
858 average of such measurements will be taken to nearest one hundredth of an
859 inch.

860
861 Thickness of finished HMA pavement shall be within 0.25 inch of
862 thickness indicated in the Contract Documents. Pavement not meeting the
863 thickness requirements of the Contract Documents may be required by the
864 Engineer to be removed and replaced.

865
866 Corrective methods taken on pavement exceeding specified
867 tolerances, e.g., insufficient thickness by methods accepted by the Engineer,
868 including removal and replacement, shall be at no increase in contract price
869 or contract time.

870
871 The checking of pavement thickness shall be done after all remedial
872 repairs, e.g., smoothness compliance repairs, compaction, have been
873 completed, reviewed, and accepted by the Engineer.

874
875
876
877
878
879
880
881
882
883
884
885
886
887
888
889
890
891
892
893
894
895
896
897
898
899
900
901
902
903
904
905
906
907
908
909
910
911
912
913
914
915
916
917

(J) Quality Control Using New Technology. The Engineer and MTRB reserves the right to utilize new technology and methods to improve the detection of noncompliant work on the project. The technology or method may be used to locate defects in the work, e.g., ground penetrating radar to locate delaminations, moisture damage, thin sections, voids, non-compliant compaction, other non-destructive testing to locate flaws. The defect will be verified by the methods stated in the Contract Documents or by other established conventional means. If the technology or method has already been accepted elsewhere or has standardized testing procedures the results may be judged acceptable by the Engineer and no further testing will be required. These new technologies and methods may be used for the selection of sampling locations.

(K) Protection of HMA Pavement. Except for construction equipment directly connected with paving operations, keep traffic off HMA pavement.

Protect HMA pavement from damage until it has cooled and set.

Do not refuel equipment or clean equipment or hand tools over paved surfaces unless catch pan or device that will contain spilled fuel and other products is provided. After completion of refueling or cleaning, remove catch pan or device without spilling any of the collected content.

Do not park roller or other paving equipment on HMA pavement paved within 24 hours of laydown.

(L) Pavement Joint Adhesive

(1) Pavement Joint Adhesive on Joints. Use on all asphalt pavement construction where joints are formed at such locations but not limited to the following:

(a) Adjacent asphalt pavements, e.g., trafficked lanes, shoulders, etc.

(b) Asphalt pavement and adjacent concrete pavement or curb and gutter or any other surface where the bonding of the asphalt pavement and concrete surface is desired,

(c) Transverse joints between asphalt pavements not placed at the same time or if the pavement's temperature on one side of the joint is below the minimum temperature the mix can be at, during asphalt pavement compaction or installation.

918
919
920
921
922
923
924
925
926
927
928
929
930
931
932
933
934
935
936
937
938

(d) Cut face of an existing pavement where it will have new HMA pavement placed against it, e.g., utility trenches, partial or full depth repairs, etc.

Pavement joint adhesive is not required on a longitudinal construction joint between adjacent hot mix asphalt pavements formed by echelon paving. Echelon paving is defined as paving multiple lanes side-by-side with adjacent pavers slightly offset at the same time.

A longitudinal construction joint between one shift's work and another shall have pavement joint adhesive applied at the joint. Any longitudinal construction joint formed, with the temperature on one side of the joint that is below the minimum temperature the mix can be when compacted to contract requirements during asphalt pavement installation, shall have pavement joint adhesive applied at the joint.

(2) **Material requirements.** Asphalt joint adhesive shall meet requirements as specified in Table 401.03-1 - Asphalt Joint Adhesive Specifications.

TABLE 401.03-1 – ASPHALT JOINT ADHESIVE SPECIFICATIONS		
TEST		SPECIFICATION
Brookfield Viscosity, 204 °C [400 °F]	ASTM D 3236	4,000-10,000 cp
Cone Penetration, 25 °C [77 °F]	ASTM D 5329	60-100 dmm
Resilience, 25 °C [77 °F]	ASTM D 5329	30% minimum
Ductility, 25 °C [77 °F]	ASTM D 113	30 cm minimum
Ductility, 4 °C [39.2 °F]	ASTM D 113	30 cm minimum
Tensile Adhesion, 25 °C [77 °F]	ASTM D 5329	500% minimum
Softening Point	ASTM D 36	77 °C [170 °F] min.
Asphalt Compatibility	ASTM D 5329	Pass

939
940
941
942
943
944
945

(3) **Construction Requirements for Asphalt Joint Adhesive**

(a) **Equipment Requirements.** Use a jacketed double boiler type melting unit, with both agitation and recirculation systems. Provide a pressure feed wand application system.

946
947
948
949
950
951
952
953
954
955
956
957
958
959
960
961
962
963
964
965
966
967
968
969
970
971
972
973
974
975
976
977
978
979
980
981
982
983
984
985
986
987
988

(b) Material Handling. Submit a copy of the manufacturer's recommendations for heating, re-heating, and applying the joint adhesive material. Follow manufacturer's recommendations. Do not remove the joint adhesive from the package until immediately before it is placed in the melter. Joint adhesive boxes must be clearly marked with the name of the manufacturer, the trade name of the adhesive, the manufacturer's batch and lot number, the application/pour temperature, and the safe heating temperature. Feed additional material into the melter at a rate equal to the rate of material used.

Verify the pouring temperature of the joint adhesive at least once per hour at the point of discharge. Stop production if the adhesive falls below the recommended application/pour temperature. When the temperature of the adhesive exceeds the maximum safe heating temperature, stop production, empty the melter, and dispose of that adhesive in an environmentally safe method. No payment will be made for this material or its disposal.

Do not blend or mix different manufacturer's brands or different types of adhesives.

(c) Joint Adhesive Application: The face of the joint that the new asphalt pavement will bind to shall be clean and dry before the joint adhesive is applied. Apply the pavement joint adhesive material to the entire face of the surface where HMA pavement shall be installed. The thickness of the asphalt adhesive application shall be approximately 1/8 inch. Use an application shoe attached to the end of application wand. Do not overlap the joint by greater than 1/2-inch at the top of the joint or two-inches at the bottom of the joint. Apply the joint adhesive immediately in front of the paving operation. If the adhesive is tracked by construction vehicles, repair the damaged area, and restrict traffic from driving on the adhesive.

(d) Field Sampling. Take a sample from the application wand during the first 20 minutes of placing sealant. One sample should be taken per manufacturer's batch or minimum of every 6 months on the Project in the presence of the Engineer.

989 Each sample shall consist of one quart in an aluminum or steel
990 sample container. The sampling container shall be labeled with
991 Contractor's name; project name and number; date and time
992 sample taken; location of where material was used at, e.g., from
993 where to where it was used at in stations; manufacturer and lot
994 number of the sealant. Turn over samples to Engineer without
995 Engineer losing sight of the sample. The Engineer reserves the
996 right to conduct supplementary sampling and testing of the
997 sealant material.

998
999 **(M) Pavement Smoothness Rideability Test.** Perform surface profile
1000 tests frequently to ensure that the means and methods being used produces
1001 pavement that is compliant with the surface profile smoothness requirement.
1002 Test the pavement surface for smoothness with High-Speed Inertial Profiler
1003 to determine the International Roughness Index (IRI) of the pavement. For
1004 the locations determined by the Engineer, a 10-foot straightedge shall be
1005 used to measure smoothness.

1006
1007 All smoothness testing must be performed with the presence of the
1008 Engineer. The High-Speed Inertial Profiler operator shall be a certified
1009 operator by MTRB or the manufacturer.

1010
1011 The High-Speed Inertial Profiler operator's certification shall be no
1012 older than five years old at the date of the Notice to Proceed and at the day
1013 of the pavement profile measurement.

1014 The finished pavement shall comply to all the following requirements:

1015
1016 **(a) Smoothness Test using 10-Foot Straightedge (Manual or**
1017 **rolling)** The 10-foot straightedge is used to identify the locations that
1018 vary more than 3/16 inch from the lower edge when the 10-foot
1019 straightedge is laid on finished pavement on the direction parallel with
1020 the centerline or perpendicular to centerline. Remove the high points
1021 that cause the surface to exceed that 3/16 inch tolerance by grinding.

1022
1023 The Contractor shall use a 10-foot straightedge for the following
1024 locations:

- 1025
1026 **1.** Longitudinal profiling parallel to centerline, when within
1027 15 feet of a bridge approach or existing pavement which is
1028 being joined.
1029
1030 **2.** Transverse profiling of cross slopes, approaches, and as
1031 otherwise directed. Lay the straightedge in a direction
1032 perpendicular to the centerline.
1033

1034
1035
1036
1037
1038
1039
1040
1041
1042
1043
1044
1045
1046
1047
1048
1049
1050
1051
1052
1053
1054
1055
1056
1057
1058
1059
1060
1061
1062
1063
1064
1065
1066
1067
1068
1069
1070
1071
1072
1073
1074
1075
1076
1077
1078

3. When pavement abuts bridge approaches or pavement not under this Contract, ensure that the longitudinal slope deviations of the finished pavement comply with Contract Document's requirements.
4. Short pavement sections up to 600 feet long, including both mainline and non-mainline sections on tangent sections and on horizontal curves with a centerline radius of curve less than 1,000 feet.
5. Within a superelevation transition on horizontal curves having centerline curve radius less than 1,000 feet, e.g., curves, turn lanes, ramps, tapers, and other non-mainline pavements.
6. Within 15 feet of transverse joint that separates pavement from existing pavement not constructed under the contract, or from bridge deck or approach slab for longitudinal profiling.
7. At miscellaneous areas of improvement where width is less than 11 feet, such as medians, gore areas, and shoulders.
8. As otherwise directed by the Engineer. The Engineer may confine the checking of through traffic lanes with the straightedge to joints and obvious irregularities or choose to use it at locations not specifically stated in this Section.

(b) High-Speed Inertial Profiler

There shall be a minimum 3 profile runs per lane, for each wheel path (left and right) which is approximately three feet from edge lane line. The segment length shall be 0.1 mi. The final segments in a lane that are less than 0.1 mi shall be evaluated as an independent segment and pay adjustments will be prorated for length. The profiles shall be taken in the direction of traffic only.

The latest version of FHWA ProVAL software shall be used to conduct profile analysis to determine IRI and areas of localized roughness. The IRI values shall be reported in units of in/mi.

Areas of localized roughness will be identified by using ProVAL's "Smoothness Assurance" analysis, calculating IRI with a continuous short interval of 25 feet and the 250-mm filter applied.

1079 Additional runs may be required by the Engineer if the data indicate a
1080 lack of repeatability of results. A 92% agreement is required for repeatability
1081 and IRI values shall have at minimum a 95% confidence level.
1082

1083 **(N) Required Pavement Smoothness**
1084

1085 The IRI for the left and right wheel paths in an individual lane will be
1086 computed and then averaged to determine the Mean Roughness Index (MRI)
1087 values. The MRI will be used to determine acceptance and pay adjustment.
1088 Each lane shall be tested and evaluated separately.
1089

1090 There are three (3) categories of target MRI values:
1091

TABLE 401.03-2 – PAVEMENT SMOOTHNESS CATEGORIES		
Category	Description	MRI
Type A	Three or more HMA Lifts	Shall not exceed 60 in/mi
Type B	Two HMA Lifts	Shall not exceed 70 in/mi
Type C	One HMA Lift	Shall not exceed 75 in/mi

1092 For the location where a 10-foot manual straightedge is required, the
1093 surface shall not vary more than 3/16 inch from the lower edge of a
1094 straightedge.
1095
1096

1097 No pre-final inspection, final inspection, and substantial completion
1098 granted will be made until the pavement meets smoothness requirement and
1099 all required profile reports are submitted to the Engineer and MTRB and are
1100 accepted.
1101

1102 **(O) Request for Profile Testing by the Department.**
1103

1104 For Type C, prior to pavement activities, the Engineer will measure the
1105 smoothness of the existing pavement.
1106

1107 The Contractor shall submit a written request to the Engineer to
1108 perform all required profile tests.
1109

1110 The request shall be made at least 30 days before desired testing date
1111 and shall include an approximate acceptance profile testing date, a plan view
1112 drawing of the area to be tested with the limits of the test area highlighted.

1113 The Contractor shall reimburse HDOT for any incurred cost related to
1114 any Contractor-caused cancellation or a deduction to the monthly payment
1115 will be made.
1116

1117 **(P) Department Requirements for Profile Testing.** When a request for

1118 testing is made, the requested area to be tested shall be 100% of the total
1119 area indicated to be paved in the Contract Documents unless the requirement
1120 is waived by the Engineer and MTRB.

1121
1122 Department acceptance surface tests will not be performed earlier
1123 than 14 days after HMA placement.

1124
1125 Clean debris and clear obstructions from area to be tested, as well as
1126 a minimum of 100 feet before and beyond the area to be tested before testing
1127 starts for use as staging areas. Provide traffic control for all profile testing.

1128
1129 The Engineer or MTRB or both may cancel the profile testing if the test
1130 area is not sufficiently clean, traffic control is unsatisfactory, or the area is not
1131 a safe work environment or test area does not meet Contract Document
1132 requirements. This canceled profile test will count as one profile test.

1133
1134
1135 **(Q) Cost of Acceptance Profile Testing by The Department.** The
1136 Engineer, MTRB, or State's Third-Party Consultant will perform one initial
1137 profile test, at no cost to the Contractor for each area to be tested.

1138
1139 The Department's High-Speed Inertial Profiler pavement profile will be
1140 used to determine if the pavement's profile, i.e., smoothness is acceptable.

1141
1142 If the profile of the pavement does not meet the requirements of the
1143 Contract Documents, the Contractor shall perform remedial work, i.e.
1144 corrective work then retest the area to ensure that the area has the required
1145 MRI, i.e., smoothness, before requesting another profile test by the Engineer.

1146
1147 **(1) Additional testing.** Additional testing, by the Department
1148 beyond the initial test will be performed at cost to the Contractor as
1149 follows:

1150
1151 **(a)** \$2,500 per test will be required when Department
1152 personnel or State's Third-Party Consultant is used.

1153
1154 **(R) Remedial Work for Pavements.**

1155
1156 **(1)** Corrective work shall be required for any 25 ft interval with a
1157 localized roughness in excess of 160 in/ mi. The Engineer may waive
1158 localized roughness requirements for deficiencies resulting from
1159 manholes or other similar appurtenances. Adjust manholes or other
1160 similar appurtenances so that using a 10-ft. straightedge the area
1161 around that manhole or other similar appurtenance shall not have
1162 more than 3/16-in. variation between any 2 contacts on the
1163 straightedge.

1164
1165
1166
1167
1168
1169
1170
1171
1172
1173
1174
1175
1176
1177
1178
1179
1180
1181
1182
1183
1184
1185
1186
1187
1188
1189
1190
1191
1192
1193
1194
1195
1196
1197
1198
1199
1200
1201
1202
1203
1204
1205
1206
1207
1208
1209

If corrective action is not successful, the Engineer may require continued corrective action, or apply a payment adjustment of \$250 per occurrence.

(2) Corrective work shall also be required for any 0.1 mile interval with an average MRI above 95.0 in/mi for Types A and B. For Type A, correct the deficient section to an MRI of 60 in/mi or less. For Type B, correct the deficient section to an MRI of 70 in/mi or less. For Type C, corrective work may be required by the Engineer for 0.1 mile intervals that have an average MRI above the threshold shown in Tables 401.03-4 and 5 as applicable.

If corrective action does not produce the required improvement, the Engineer may require continued corrective action, or apply payment adjustment as shown in Tables 401.03-4 and 5.

(3) The Contractor shall notify the Engineer at least 24 hours prior to commencement of the corrective work. The Contractor shall not commence corrective work until the methods and procedure have been approved in writing by the Engineer.

(4) All smoothness corrective work for areas of localized roughness shall be for the entire lane width. Pavement cross slope shall be maintained through corrective areas.

(5) The remedial repair areas shall be neat, rectangular areas having a uniform surface appearance.

(6) If grinding is used on HMA pavement, the surface shall have nearly invisible grinding marks to passing motorist.

(7) Other methods may include milling and overlaying HMA pavement. The length, depth of the milling and the replacement material will be solely decided by the Engineer.

(8) The finished repaired pavement surface shall leave no ridges or valleys or fins of pavement other than those allowed below.

(9) Remedial repairs shall not leave any drainage structures' inlets higher than the surrounding pavement or alter the Contract Document's drainage pattern.

(10) For items in the pavement other than drainage structures, e.g., manhole frame and covers, survey monuments, expansion joints etc., the finish pavement, ground or not, shall not be more than 1/4 inch in

1210
1211
1212
1213
1214
1215
1216
1217
1218
1219
1220
1221
1222
1223
1224
1225
1226
1227
1228
1229
1230
1231
1232
1233
1234
1235
1236
1237
1238
1239
1240
1241
1242
1243
1244
1245
1246
1247
1248
1249
1250
1251
1252
1253
1254
1255

elevation difference. Submit to the Engineer remedial repair method to correct these conditions for acceptance.

(11) Pick up immediately grinding operation residue by using a vacuum attached to grinding machine or other method acceptable to the Engineer.

(a) Any remaining residue shall be picked up before the end of shift or before the area is open to traffic, whichever is earlier.

(b) Prevent residue from flowing across pavement or from being left on pavement surface or both.

(c) Residue shall not be allowed to enter the drainage system.

(d) The residue shall not be allowed to dry or remain on the pavement.

(e) Dispose of all material that is the result of the remedial repair operation, e.g., HMA residue, wastewater, and dust at a legal facility.

(12) Complete corrective work before determining pavement thickness for HMA pavements in accordance with Subsection 401.03(I) – HMA Pavement Thickness Tolerances.

(13) All HMA wearing surface areas that have been ground shall receive a coating, e.g., a coating material that will restore any lost impermeability of the HMA due to the grinding of the surface. The coating used shall not be picked up or tracked by passing vehicles or be degraded after a short period of time has passed, i.e., it shall have a service life equal to or greater than the HMA pavement. The coating shall not decrease the pavement's friction value. The coating's limits shall be the full width of the lane regardless how small. If the remedial repair area extends into the next lane, then the repair area will be full lane width also. Extend the length of coating areas in order for the coating area to look like the rest of the road and does not have patches on it, i.e., make the road look uniform in color. The coating shall be of a color that matches the surrounding pavement. The areas receiving the coating shall not be open to traffic until it has cured enough so that it cannot be picked up or tracked by passing vehicles or degrade. Submit means and methods of the coating and type of coating to the Engineer or MTRB for review and acceptance. Do not proceed with the coating without acceptance from the Engineer.

1256
1257
1258
1259
1260
1261
1262
1263
1264
1265
1266
1267
1268
1269
1270
1271
1272
1273
1274
1275
1276
1277
1278
1279
1280
1281
1282
1283
1284
1285

(14) Recompacting cold HMA, i.e., HMA that has reached ambient temperature is not an acceptable remedial repair method.

(15) Replace all pavement markings damaged or discolored by remedial repairs.

(16) Reprofile the corrected area and provide the Engineer the results that show the corrective action, i.e., remedial repairs were successful.

(S) Pavement Smoothness and Acceptance.

(1) Price and payment in various paving sections, e.g., 401 (Hot Mix Asphalt Pavement), shall be full compensation for all work and materials specified in the various paving sections and this section, including but not limited to furnishing all labor, materials, tools, equipment, testing, incidentals and for doing all work involved in micro milling, milling (cold planing), grinding existing or new pavement, removing residue, cleaning the pavement, necessary disposal of residue, furnishing of any water or air used in cleaning the pavement and any other related ancillary work or material or services. Also, it includes any remedial work, e.g., re-paving, surface grinding, application of a coating, curing compound, and replacement of damaged pavement markings.

(2) The contract price in those sections may be adjusted for pavement smoothness by the Engineer. The pavement smoothness contract unit price adjustments and work acceptance will be made in accordance with the following schedules.

TABLE 401.03-3 –SMOOTHNESS PAY INCENTIVES		
Category	MRI (in/mi)	Pay Adjustment \$ per 0.1 mi
Type A (Three or more HMA Lifts)	<30.0	\$580
	30.0- less than 35.0	\$480
	35.0- less than 40.0	\$380
	40.0- less than 45.0	\$280
	45.0- less than 50.0	\$180
	50.0- less than 55.0	\$80
	55.0- less than 60.0	\$0
Type B (Two HMA Lifts)	<35.0	\$420
	35.0- less than 40.0	\$360
	40.0- less than 45.0	\$300
	45.0- less than 50.0	\$240
	50.0- less than 55.0	\$180
	55.0- less than 60.0	\$120
	60.0- less than 65.0	\$60
	65.0- less than 70.0	\$0
Type C (One HMA Lift)	<40.0	\$280
	40.0- less than 45.0	\$240
	45.0- less than 50.0	\$200
	50.0- less than 55.0	\$160
	55.0- less than 60.0	\$120
	60.0- less than 65.0	\$80
	65.0- less than 70.0	\$40
	70.0- less than 75.0	\$0

1286
1287

1288
1289
1290
1291
1292
1293
1294
1295
1296
1297
1298
1299
1300
1301
1302
1303
1304
1305
1306
1307
1308
1309
1310
1311
1312
1313
1314
1315
1316
1317
1318
1319
1320
1321
1322
1323
1324
1325
1326
1327
1328
1329

(3) Pay Pavement Smoothness Adjustment will be based on the initial measured MRI for both left and right wheel path, prior to any corrective work for the 0.10-mile section, except for sections that the Contractor has chosen to remove and replace. For sections that are replaced, assessments will be based on the MRI determined after replacement.

(a) The Pavement Smoothness Adjustment will be computed using the plan surface area of pavement shown in the Contract Documents. This Pavement Smoothness Adjustment will apply to the total area of the 0.10-mile section for the lane width represented by MRI for the same lane. It does not include any other price adjustments specified in the Contract Documents. Those price adjustments will be, for each adjustment, calculated separately using the original contract price to determine the amount of adjustment to be made to the contract price. Sections shorter than 0.1 mile and longer than 50 feet shall be prorated.

(b) For 0.1 mile intervals with an average MRI above the threshold shown in Table 401.03-3, the Engineer shall apply a disincentive payment adjustment up to the limit shown.

- i. For Types A and B, payment adjustments shall be applied up to an MRI of 95.0 per Table 401.03-4.
- ii. For Type C, the payment adjustment shall be dependent on the average MRI of the pavement prior to paving activities
 - 1. If the MRI of the pavement prior to paving activities is 125.0 in/mi or less, the payment adjustment shall be per Table 401.03-4.
 - 2. If the MRI of the pavement prior to paving activities is more than 125.0 in/mi, the disincentive payment adjustment shall be per Table 401.03-5, and based on the percent improvement using the following formula:

$$\% \text{ Improvement} = (\text{Initial segment MRI} - \text{Final segment MRI}) \times 100 / (\text{Initial Segment MRI})$$

1330

TABLE 401.03-4 –SMOOTHNESS PAY DISINCENTIVES WITH MRI		
Category	MRI (in/mi)	Pay Adjustment \$ per 0.1 mi
Type A (Three or more HMA Lifts)	60.0- less than 65.0	-\$100
	65.0- less than 70.0	-\$250
	75.0- less than 80.0	-\$350
	80.0- less than 85.0	-\$450
	85.0- less than 95.0	-\$550
	> 95.0	Corrective Work
Type B (Two HMA Lifts)	70.0- less than 75.0	-\$100
	75.0- less than 80.0	-\$200
	80.0- less than 85.0	-\$300
	85.0- less than 95.0	-\$400
	> 95.0	Corrective Work
Type C (One HMA Lift) (pre-paving MRI < 125)	75.0- less than 80.0	-\$50
	80.0- less than 85.0	-\$100
	85.0- less than 90.0	-\$150
	90.0- less than 100.0	-\$200
	>100.0	-\$250

1331

TABLE 401.03-5 –SMOOTHNESS PAY DISINCENTIVES FOR PERCENT IMPROVEMENT		
Category	Percent Improvement %	Pay Adjustment \$ per 0.1 mi
Type C (One HMA Lift)	≥ 40	\$0
	20.0- less than 40.0	-\$100
(pre-paving MRI > 125)	< 20	-\$200

1332

1333

1334

1335

1336

1337

1338

(c) Incentives will not apply to areas where payment deductions or remedial repairs has been made for non-compliant work, e.g., low compaction, thin pavement, thermal segregation, low compressive or flexural strength, non-compliant alignment. Incentives will also not apply to areas where corrective work was required to meet contract

1339
1340
1341
1342
1343
1344
1345
1346
1347
1348
1349
1350
1351
1352
1353
1354
1355
1356
1357
1358
1359
1360
1361
1362
1363
1364
1365
1366
1367
1368
1369
1370
1371
1372
1373
1374
1375
1376
1377
1378
1379
1380
1381
1382
1383
1384

smoothness requirements, unless the pavement section was replaced. All areas where corrective work was performed shall be tested again to ensure the smoothness requirements are met.

(d) There will be no incentive price adjustments to the contract prices regardless of the pavement meeting the Contract Documents' requirements for incentive contract price adjustment, when 25% of the total area paved of that particular type of pavement on the project has failed to meet any of the Contract document requirements, e.g., smoothness, thickness, unit weight, asphalt content, pavement defects, compaction, flexural or compressive strength. Areas exempt from the smoothness requirements may not be included in the total area calculation unless it is non-compliant.

(e) For contracts using lump sum the method described in Subsection 104.06 Methods of Price Adjustment paragraph (3), will be used to calculated proportionate unit price, i.e., the Engineer's calculated theoretical unit price. This calculated proportionate unit price will be used to calculate the unit price adjustment.

401.04 Measurement.

(A) The Engineer will measure HMA pavement per ton in accordance with the Contract Documents.

(B) Engineer will measure additional State pavement profiling work when applicable on a cost-plus basis as specified in this section and as ordered by Engineer. The Engineer will issue a billing for the pavement profile work done for the time period with the invoices and receipts that the billing was based on attached to the Contractor for each contract item. The Contractor's pavement profile work required in this section will not be measured and will be considered incidental to the various paving items unless stated otherwise.

401.05 Payment. The Engineer will pay for the accepted HMA pavement at the contract price per pay unit, as shown in the proposal schedule. Payment will be full compensation for the work prescribed in this section and the contract documents.

(A) Price and payment in Section 401 – HMA Pavement will be full compensation for all work and materials specified in this Section including furnishing all labor, materials, tools, equipment, testing, pavement profiles and incidentals and for doing all work involved in grinding existing or new pavement, removing residue, and cleaning the pavement, including necessary disposal of residue and furnishing any water or air used in

1385 cleaning the pavement and remedial work needed to conform to the
1386 requirements of the Contract Documents.

1387
1388 **(B)** No payment for the Contractor's pavement profile work required in this
1389 section will be made. The Contractor's pavement profile work shall be
1390 considered incidental to the various paving items unless stated otherwise.

1391
1392 **(C)** Engineer will pay or deduct for the following pay items when included
1393 in proposal schedule:

1394

Pay Item	Pay Unit
1395 Pavement Smoothness Incentive	1396 Allowance
1397 _____ PMA Pavement, Mix No. IV	1398 Ton

1400
1401 **(1)** 70% of the contract unit price or the theoretical calculated unit
1402 price upon completion of submitting a job-mix formula acceptable to
1403 the Engineer; preparing the surface, spreading, and finishing the
1404 mixture; and compacting the mixture.

1405
1406 **(2)** 20% of the contract unit price or the theoretical calculated unit
1407 price upon completion of cutting samples from the compacted
1408 pavement for testing; placing and compacting the sampled area with
1409 new material conforming to the surrounding area; protecting the
1410 pavement; and compaction acceptance. Maintain temporary
1411 pavement markings and other temporary work zone items, maintain a
1412 clean work site.

1413
1414 **(3)** 10% of the contract unit price or calculate the unit price when
1415 the final configuration of the pavement markings is in place.

1416
1417 The Engineer will pay for adjusting existing frames and covers and valve
1418 boxes in accordance with and under Section 604 – Manholes, Inlets and Catch
1419 Basins. Adjustments for existing street survey monument frames and covers will be
1420 paid for as if each were a valve box frame and cover.

1421
1422 The Engineer may, at his sole discretion, in lieu of requiring removal and
1423 replacement, use the sliding scale factor to accept HMA pavements compacted
1424 below 93.0 percent and above 97.0 percent. The Engineer will make payment for
1425 the material in that production day, if the Engineer decides to use a sliding scale
1426 factor, at a reduced price arrived at by multiplying the contract unit price by the pay
1427 factor. The Engineer is not obligated to allow non-compliant work to remain in place
1428 and may at any time chose not to use a sliding scale factor method of payment and
1429 instead require removal of the noncompliant pavement that is greater than 97.0 or
1430 less than 93.0.

1431
1432
1433
1434
1435
1436
1437
1438
1439
1440
1441
1442
1443
1444
1445
1446
1447
1448
1449
1450
1451
1452
1453
1454
1455
1456
1457
1458
1459
1460
1461
1462
1463
1464
1465
1466
1467
1468
1469
1470
1471
1472
1473
1474
1475
1476

In compliance with Subsection 105.12 Removal of Non-Conforming and Unauthorized Work remove and replace HMA compacted below 90.0 percent.

The Engineer will solely decide if the noncompliant work would be acceptable if a reduced payment for the noncompliant work is made. The Engineer is not obligated to allow noncompliant work to remain in place and may at any time choose not to use a sliding scale factor method of payment as a method of resolution. Instead, utilize the remedy allowed in Subsection 105.12 Removal of Non-Conforming and Unauthorized Work, requiring removal of the noncompliant pavement, shall be used.

Such a reduced payment, if made and accepted by the Contractor, shall be a mutually agreeable resolution to the noncompliant work being addressed. If it is not mutually acceptable, the noncompliant work shall be removed. If the reduced payment is acceptable; the Engineer will make the reduced payments for the noncompliant work in accordance with Table 401.05-2 - Sliding Scale Pay Factor for Compaction. The amount of tonnage to be reduced will be determined by the Engineer by using the initial cores taken on the mat. No additional cores shall be taken to determine the limits of the non-compliant area unless requested by the Engineer.

The Engineer, for determining the reduced tonnage for noncompliant work, will assume the level of compaction is linear and will proportion the compaction level from the last core that indicated an acceptable compaction level to the nearest core indicating a noncompliant compaction level to determine the calculated limit of acceptable compaction. The length will be the linear distance between the cores measured along the baseline. If there is no core that was taken for the shift's or day's work that were compliant then the limit will be the end or start of the day's or shift's work. The width will be the nominal paving width. Use the day's specific gravity of the mix to determine tonnage. The thickness will be the nominal paving thickness.

The total reduced noncompliant tonnage to be paid will be determined by multiplying the applicable percent of reduction by the computed tonnage of the noncompliant work. Percent of Quantity Paid shall be the percentage shown in Table 401.05-2 - Sliding Scale Pay Factor for Compaction. The reduced tonnage shall be used as the payment quantity for the noncompliant work. The reduced quantity paid that is used for the monthly payment will be arrived at by multiplying the contract unit price by the reduced tonnage.

Table 401.05-2 – Sliding Scale Pay Factor for Compaction	
Percent Compaction	Percent of Quantity Paid
> 98.0	Removal
>97.0 - 98.0	95
93.0- 97.0	100
90.0 - <93.0	80
<90.0	Removal

1477
1478
1479
1480
1481

END OF SECTION 401”

1 **SECTION 407 – TACK COAT**

2
3 Make the following amendments to said Sections:

4
5 **(I) Amend Section 407.03(D) Application of Tack Coat** by revising the
6 second paragraph from lines 63 to 68 to read as follows:

7
8 "Apply tack coat on existing asphalt or concrete surface, or both, to
9 be overlaid by HMA course. Once water has evaporated from asphalt
10 emulsion, tack coat is said to have set. Place HMA overlay after tack coat
11 has set and within four hours of application. For multiple lift construction,
12 tack coat application will not be waived. Remove all deleterious material
13 to bonding before applying the tack coat to the entire surface to receive
14 the next lift."

15
16 **(II) Amend Section 407.03(D) Application of Tack Coat** by revising the
17 third paragraph from lines 70 to 72 to read as follows:

18
19 "Before placing HMA course, apply tack coat to contact surfaces of
20 curbs, gutters, manholes, other structures, vertical faces of existing
21 pavements, and exposed transverse and longitudinal edges of each
22 course edges of each course. Apply tack coat on all surfaces that will
23 have an asphalt pavement placed on it in an uniform, full coverage
24 manner, e.g., no visible streaks, holidays in the application, no differences
25 in the application rate, i.e., thickness of the tack coat. The exception to
26 this requirement shall be surfaces that will have pavement joint adhesive
27 applied to it which shall not require any tack coat."

28
29
30
31 **END OF SECTION 407**

1 **Amend Section 411- PORTLAND CEMENT CONCRETE PAVEMENT to read**
2 **as follows:**

3
4 **“SECTION 411 - PORTLAND CEMENT CONCRETE PAVEMENT**

5
6 **411.01 Description.** This section describes constructing unbonded
7 portland cement concrete (PCC) pavement, with or without reinforcement, on
8 a prepared surface.

9 **411.02 Materials.**

10	Structural Concrete (minimum 14-day flexural strength, $f_r = 650$ psi)	601
11	Joint Filler	705.01
12	Joint Sealer	705.04
13	Reinforcing Steel	709.01
14	Curing Materials	711.01

15 **411.03 Construction.**

16 **(A) Paving Plan.** Submit paving plan no later than 30 days after contract
17 award. Paving plan shall be complete and provide all information required.
18 No partial submittal, except as noted, will be accepted. Partial submittals
19 will be returned without review. The Engineer will review the paving plan in
20 accordance with Subsection 105.04 – Review and Acceptance Process.
21 Obtain acceptance of paving plan from the Engineer before starting the test
22 strip or any paving work including but not limited to any roadway excavation
23 and subbase preparation and installation. Installation plan shall include but
24 not be limited to the following:

25 **(1)** Type, make, model and number of all equipment to be used
26 for placing, finishing, curing, saw cutting, and diamond grinding of
27 concrete pavement. Include a list of the equipment to be used and
28 the number of equipment to be held in reserve in anticipation of
29 breakdown. Provide the number of finishing bridges that will be used
30 for thickness checking, finishing, touch-up curing.

31 **(2)** Provide details of:

32 **(a)** Traffic control, methods to protect the public.

33 **(b)** Grade control methods for each operation. If low
34 slump concrete is to be used list method as to how required
35 grades will be maintained.

- 36 **(c)** Repair of non-compliant areas
- 37 **(d)** PCC concrete placement, including but not limited to,
38 proposed operational procedures, subgrade protection, delivery
39 or pumping, leveling, finishing methods, thickness checking,
40 equipment, etc. Dowel and tie bar placement method and
41 equipment.
- 42 **(e)** How weather conditions detrimental to the PCC will be
43 addressed. Rain, hot weather, wind, humidity, etc. shall be
44 monitored and addressed. Include assumed temperature of
45 concrete to be used in initial calculation of evaporation rate.
46 Include action plans that are to be used should bad weather
47 conditions, e.g., high wind, rain, high temperature, occur or will
48 occur during pour. List make and model of weather monitoring
49 instruments, to be used at the location of concrete placement,
50 to measure the ambient air temperature, relative humidity and
51 wind velocity to determine the on-site real-time evaporation
52 rate.
- 53 **(f)** Curing means and methods, equipment and materials.
54 Method to be used to determine application rate of curing
55 compound. Method of continuous agitation used to keep
56 uniform distribution of pigment solids in the curing compound.
- 57 **(g)** Saw cutting of PCC, list equipment, e.g., what brand
58 and model of early-entry concrete saw will be used, number of
59 equipment, manpower, how it will be determined when to start
60 cutting, how the proper saw blade will be chosen that minimizes
61 raveling of the concrete during sawing of the joint, anticipated
62 joint saw cutting rate.
- 63 **(h)** Diamond grinding and grooving, equipment list, control
64 of slurry and debris. Slurry and debris disposal method and
65 location.
- 66 **(i)** Construction operation sequence and location of
67 panels/blocks and order they will be constructed in.
- 68 **(j)** How block outs for handholes, pull boxes, manhole
69 frames and covers, drain inlets, etc., in the PCC will be
70 addressed including the backfill around them and dowel tie bar
71 or reinforcing steel patterns.
- 72 **(k)** Saw cutting pattern plan. Indicate location of areas
73 where panels will be irregular in shape. Size of plan sheet shall

- 74 be a minimum of 24" X 36". The Engineer may require larger
75 or more detailed plans at no additional cost.
- 76 **(l)** List of ACI Certified Flatwork Finisher and Technicians
77 and a copy of their certification.
- 78 **(m)** List of material certifications, submittals and required
79 reports to be submitted and their tentative submittal schedule.
- 80 **(n)** Testing laboratory, AASHTO re: source (formally
81 AMRL) accredited shall be used for all testing, list testing
82 methods to be provided by that material testing laboratory. List
83 certifications of technicians showing the test method they are
84 certified in. If a commercial AASHTO re: source accredited
85 testing laboratory is not readily available on the island where
86 the work is taking place the Engineer may allow a non-
87 accredited AASHTO re: source testing laboratory to perform the
88 tests. Provide documentation that an AASHTO re: source
89 accredited laboratory does not exist on the island and submit
90 qualifications of the material testing laboratory who will perform
91 the tests.
- 92 The Engineer is not under any obligation to grant a waiver from
93 using an accredited testing laboratory or accept or consider
94 valid any results from a non-certified testing laboratory. The
95 Contractor is required to used due diligence in obtaining an
96 accredited laboratory. No waiver will be granted by the Engineer
97 to use a non-certified technician to perform a test method it is
98 not certified in. Tests performed by a technician not certified in
99 that test method will not be acceptable. Any impact, e.g., delay,
100 cost incurred by the Contractor in obtaining an AASHTO re:
101 source accredited laboratory or certified technician shall be
102 borne by the Contractor.
- 103 **(o)** Proposed concrete mix design, including expected
104 strengths at 24-hours, 3, 7, 14 and 28 days. If the opening of
105 pavement is to be scheduled for a time period other than the
106 time period stated in this paragraph, submit test for that time
107 period to ensure the concrete will meet Contract requirements.
108 Submit test results of both a trial mix conducted by
109 State-accepted testing laboratory using methods specified in
110 Subsection 601.03(B) – Design and Designation of Concrete.
- 111 **(p)** The arrangements for preventing delay in concrete
112 delivery and placement. An interval of more than 30 minutes

113 between placement of two consecutive batches or loads may
114 constitute cause for stopping paving operations. A
115 construction joint shall be placed, at location and of the type
116 ordered by the Engineer, show how this shall be
117 accomplished.

118 (q) Method of removal of curing compound in areas where
119 there will be pavement marking installed.

120 (r) Other pertinent information or information requested by
121 the Engineer

122 (3) All requirements shall be done at no impact to the State, e.g.,
123 no increase in contract price or contract time, the work shall be
124 regarded as incidental to the contract items of this Section.

125 The Engineer will review the paving plan for compliance with the Contract
126 Documents. Within 30 days after the paving plan receipt, the Engineer will
127 notify the Contractor if the paving plan is acceptable or if additional
128 information is required, or there is a need for clarification, or combination
129 thereof, etc. If applicable, make changes necessary to meet requirements
130 of the Contract Documents. The Engineer may reject parts of or the entire
131 paving plan if found unacceptable. Resubmit entire paving plan with
132 changes for re-evaluation within 30 days. The Engineer will have the same
133 amount of time for the review of each resubmitted paving plan as it did for
134 the original submittal. Submit revised paving plan until it is acceptable to
135 the Engineer. Any delay due to the paving plan not being acceptable is
136 solely a Contractor's delay and no additional compensation or contract time
137 will be granted. However, if the Engineer's review and response to the
138 paving plan exceeds the 30 days allowed for the review of each version of
139 the paving plan, additional time and compensation may be claimed for.
140 Procedural acceptance given by the Engineer is subject to trial in the field.

141 All testing shall be performed by an Engineer accepted laboratory and
142 technician. For samples that will be used to determine compliance and
143 acceptance of the material; the Engineer will transport the Department's
144 samples to the laboratory from the project site for testing. Provide help,
145 e.g., labor, equipment, material, to Department personnel when requested.
146 Provide storage, transport facility or both for the samples for use in the
147 Department vehicle. No sample of material taken without HDOT personnel
148 being present and having full custody of the sample shall be used to
149 determine compliance with the Contract Documents and acceptance by the
150 Department.

151 (B) Equipment.

152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181
182
183
184
185
186
187
188
189
190

(1) Batching Plant and Mixers. Batching plant and mixers shall comply to Section 601 - Structural Concrete.

(2) Hauling Equipment. Hauling equipment shall comply to Section 601 - Structural Concrete.

(3) Finishing Equipment.

(a) Finishing Machine. Finishing machine shall be self-propelled and equipped with at least two oscillating-type, transverse screeds that shall finish the surface to meet requirements specified in Subsection 411.03(N) - Surface Test and Subsection 411.03(T) - Pavement Thickness. Finishing equipment shall not displace reinforcement, side forms, or joints.

(b) Vibrators. Vibrators for full-width concrete consolidation may be either internal-type, with immersed tube or multiple spuds, or surface pan type. Vibrators shall be attached to spreader or finishing machine or shall be mounted on separate carriage. Vibrators shall not come in contact with reinforcement, load transfer devices, subgrade, and side forms. Vibrators shall not be dragged horizontally or nearly horizontally through the concrete, when moved the vibrators shall be lifted out of the concrete and placed perpendicular to the concrete surface.

Furnish vibrators that operate at frequencies not less than the following: 3,500 impulses per minute for surface vibrators; and 5,000 impulses per minute for internal and hand vibrators. Furnish tachometer for measuring and indicating vibration frequencies along with a test certifying to the tachometer's accuracy. Test all vibrators with tachometer in front of the Engineer every day concrete is poured,

(c) Mechanical Floats. Mechanical floats shall be self-propelled and designed to finish pavement surface uniformly smooth and true to grade. Run mechanical floats either on side forms or on adjacent lanes of concrete. No supports for the mechanical floats shall be used that are in the area where concrete is being poured. Block outs for the mechanical floats supports in concrete within the area being poured shall not be used the lane shall be poured essentially monolithically with the exception of transverse construction joints at the end of the shift's work or block outs for utility frames and covers.

191 Floats shall be constructed of hardwood, steel, or steel-shod
192 wood and shall be equipped with devices to permit adjusting
193 underside to a true flat surface.

194 **(d) Slip-Form Pavers.** Slip-form pavers shall be
195 self-propelled and equipped with traveling side forms of
196 sufficient dimensions, shape, and strength to spread,
197 consolidate, and screed freshly placed concrete in one
198 complete pass, with minimum hand finishing. Pavers shall
199 produce dense and homogeneous pavement, true to cross
200 section and profile indicated in the contract documents.

201 Slip-form pavers shall be equipped with high-frequency internal
202 vibrators that vibrate concrete for full paving width and depth.

203 Vibrators may be mounted with their axes either parallel or
204 normal to pavement alignment. Where vibrators are mounted
205 with their axes parallel to pavement alignment, space vibrators
206 at intervals not to exceed 2.5 feet, measured center to center.
207 Where vibrators are mounted with their axes normal to
208 pavement alignment, space vibrators so that the lateral
209 clearance between individual vibrating units does not exceed
210 0.5 feet. Pavers shall be equipped with gauges that monitor
211 each individual vibrator's frequency.

212 Setup vibrators in a manner that eliminates vibrator trails.
213 Vibrator trails exhibit coarse-aggregate segregation and low air
214 contents, which leads to longitudinal cracking. It will be cause
215 for the Engineer to consider the PCC pavement non-compliant
216 and may require its removal.

217 While concrete pavement is being spread, compacted, and
218 shaped, operate vibrating units in such a manner that their
219 longitudinal axis, at the center of each unit, is not more than 0.5
220 feet above existing paving surface.

221 Paving operations may be conducted using either one machine
222 or mechanical spreader followed by separate finishing unit.

223 **(4) Concrete Saw.** If sawed joints are specified or elected by the
224 Contractor, all saws shall be power-driven early-entry concrete saws.
225 The early-entry concrete saws shall be sufficient in number, power,
226 and type of blade to cut joints cleanly. Choose an early-entry
227 concrete saw blade that will prevent excessive tearing or raveling, or
228 both during sawing operations. Provide at least one back-up
229 early-entry concrete saw and one replacement blade for each saw

230 used during concrete sawing operations. Equip saws with blade
231 guards and guides or devices to control alignment and depth.
232 Remove all cuttings, slurry, and other by-products of the sawing
233 operations immediately from the sawed surface and from the work
234 site. Submit with the three-week detailed work schedule, the week
235 before the pour, the linear feet of joints to be sawed for the day's pour
236 and how long it is anticipated it will take.

237 **(5) Forms.** Use 10-foot-long straight side forms made of metal
238 having been constructed of sheet metal with a thickness of 7/32-inch
239 or more, depth of the form shall be equal to prescribed pavement
240 edge thickness, and base width of the form not less than 80 percent
241 of prescribed pavement thickness. Horizontal form joints will not be
242 allowed unless built-up forms, as specified in this subsection, are
243 accepted by the Engineer. Forms shall be sufficiently rigid to prevent
244 edge alignment distortion under such conditions as but not limited to,
245 subgrading and equipment loads or concrete pressure, or a
246 combination thereof. Furnish form sections that are clean, straight,
247 free from bends, warps, indentations, and other defects. Sections
248 that deviate from true plane along top of form more than 1/8 inch in
249 10 feet or along face of form more than 1/4 inch in 10 feet shall be
250 rejected and readjusted. Forms shall be placed so they are
251 perpendicular to the pavement's surface shown in the Contract
252 Documents and remain that way until they are stripped. Concrete
253 poured using misaligned forms or result in misalignment of the
254 concrete will not be acceptable to the Engineer and will be regarded
255 as non-compliant work and will not be acceptable.

256 Join form lengths in a manner that ensures tight, leak proof, neat
257 joints at form connections and prevents springing from occurring
258 under such conditions as but not limited to, subgrading and paving
259 equipment loads or concrete pressure, or combination thereof.

260 Built-up forms may be used by rigidly attaching sections` of suitable
261 width and thickness to either top or bottom of form. The attaching
262 method shall be such that it makes the connecting forms act as if it
263 is one piece. If a built-up form is attached to top of form, the built-up
264 form shall be metal and shall be acceptable to the Engineer.

265 For curves of 100-foot radius or less, use flexible forms or curved
266 forms having proper radius. Special forms of wood or metal may be
267 used for curved form lines having radius of 200 feet or less. Five-
268 foot-long, straight metal form sections may be used for curved form
269 lines having radius greater than 100 feet. Straight metal forms in

270 sections 10 feet or less in length may be used for form lines having
271 radius greater than 200 feet.

272 Where use of standard pavement forms is not feasible, submit
273 working drawings as part of the paving plan. Five-foot-long, straight
274 metal form sections may be used for curved form lines having radius
275 greater than 100 feet.

276 Use of wood forms as a track for operating paving and finishing
277 equipment shall not be allowed.

278 **(C) Preparing the Proper Grade.** Trim a minimum of one foot beyond
279 edges of proposed concrete pavement forms and slip-form paving
280 equipment. Areas that are below established grade with subgrade or base
281 course material, using widths of 18 inches on both sides of the form's base
282 fill and compact in lifts up to six-inches. Tamp and trim areas above
283 established grade, as necessary. The surface that the forms are to be
284 placed on shall not deflect when the concrete placing equipment is run on
285 it.

286 **(D) Setting Forms.** Before placing forms, compact the area which the
287 forms shall use as a foundation. Ensure continuous contact between
288 foundation and forms, leave no gaps. Tamp inside and outside edges of
289 form base. After setting forms, check for correct line and grade before
290 placing concrete. Adjust forms if needed.

291 Use a minimum of three pins for each 10-foot section to stake forms in
292 place. Pins shall be long enough to prevent the forms from moving during
293 and after the concrete pour while the concrete is in a plastic state. Place
294 additional pins on the outside of each side of every form joint. Lock form
295 sections to prevent play or movement in any direction. Forms shall
296 withstand impact and vibration due to concrete placement and consolidation
297 operations and shall remain true to within 1/4 inch. More pins or other
298 devices shall be used to achieve the required rigidity and alignment
299 tolerances. Before placing the forms, clean and coat forms with form
300 release agent or oil, which has been accepted by the Engineer. At least
301 one working day or 24 hours whichever is greater, prior to placing concrete,
302 forms shall be in place and in compliance with the requirements of the
303 Contract Documents. Notify the Engineer that forms are ready for
304 inspection, a minimum of one working day or 24 hours whichever is greater,
305 prior to the placing concrete.

306 **(E) Conditioning of Subgrade or Base Course.** Unless waterproof
307 cover material is indicated in the Contract Documents, keep subgrade and
308 base course uniformly moist before placing concrete i.e., leave aggregate

309 surfaces used as the subgrade or base course in a cool, saturated surface
310 dry (SSD) condition. The subgrade or base course shall be kept within 15
311 degrees of the anticipated concrete temperature.

312 **(F) Handling, Measuring, and Batching Materials.** Handle, measure,
313 and batch materials in accordance with Section 601 - Structural Concrete.

314 **(G) Mixing Concrete.** Mix concrete in accordance with Section 601 -
315 Structural Concrete.

316 **(H) Mixing Limitations and Water Supply.** Provide for adequate
317 natural or artificial lighting when mixing, placing, and finishing concrete.

318 Place mixed concrete only when concrete temperature is between 50- and
319 90-degrees F.

320 Use Plastic Shrinkage Evaporation Chart in ACI 305R-20, Guide to Hot
321 Weather Concreting or its later published document as a guide to determine
322 if additional precautions should be taken to prevent shrinkage cracks.

323 Approximately 30 minutes prior to the scheduled start of concrete
324 placement, at the project site and at the location of concrete placement
325 measure the ambient air temperature, relative humidity and wind velocity
326 with industrial grade weather monitoring instruments to determine the
327 on-site evaporation rate. Compute the evaporation rate by using the
328 nomograph in the ACI 305R Hot Weather Concreting or by using an
329 evaporation rate calculator reviewed and accepted by the Engineer.

330 The temperature of the concrete used in the initial calculation of the
331 evaporation rate shall be the accepted value stated in the paving plan until
332 sufficient data is obtained by current on-site testing to calculate a new value
333 based on on-going pours.

334 If the evaporation is or is likely to become 0.1 lb/ft²/hr or greater, employ
335 measures to prevent moisture loss such as but not limited to, the application
336 of evaporation retarder, application of supplemental moisture by fogging or
337 reduction of the concrete temperature during batching, reduction of wind
338 velocity or other means accepted by the Engineer that were included in the
339 paving plan. Evaporation retarder shall be diluted at half the rate of the
340 manufacturer's recommendation and it shall not be used to finish concrete
341 in the same manner that the prohibited practice of sprinkling water on the
342 concrete surface would be, i.e., as a wetting agent, sprinkled on the
343 concrete surface and then floated or toweled.

344 The sprinkling of water onto the plastic concrete surface is prohibited.

345 During the placement of the concrete recalculate evaporation rate every 15
346 minutes using new real-time data including actual temperature of the

347 concrete being placed at the time. Submit all data and calculations with a
348 copy of the nomograph used to the Engineer within 24 hours or next working
349 day whichever is later.

350 If an evaporation retarder's use is a mandatory part of the Contractor's
351 accepted paving plan, the monitoring of the weather, concrete conditions
352 and the use of the nomograph may have its frequency reduced to one test
353 every 30 minutes, provided in the sole opinion of the Engineer, the
354 application successfully prevented cracks in the concrete. Monitoring may
355 be increased up to the required frequency again by the Engineer if directed.
356 When cracks appear re-examine the means and methods for the use of the
357 evaporation retarder, revise it, e.g., change evaporation retarder, or dosage
358 or add addition methods like foggers, until cracks no longer appear.

359 Before placing concrete pavement, provide adequate supply of water for
360 entire work period. Inadequate water supply will be sufficient cause for
361 delaying or stopping mixing operations. If there is an unanticipated water
362 supply deficiency, give first water-use priority to curing concrete already
363 placed before using water for mixing concrete or other uses.

364 **(I) Placing, Consolidating, and Shaping Concrete.**

365 **(1) Test Strip.** Prior to production PCC placement demonstrate
366 ability to place PCC pavement by constructing test strips. Place the
367 PCC on a continuous basis and consolidate, finish, texture, cure and
368 saw joints in a timely manner and in compliance with the
369 requirements of the Contract Documents and the Engineer accepted
370 paving plan.

371 Also included in the scope of work are traffic control, installation and
372 maintenance of BMPs, and when required by the Engineer the filling
373 of the surrounding void in the asphalt pavement around the test strip.

374 Construct the test strip using the same means and methods as stated
375 in the Engineer accepted paving plan and is to be used in the
376 production PCC. Concrete shall be the accepted mix design for the
377 PCC.

378 Install temporary pavement markers to replace existing marking that
379 were removed or damaged by the installation of the test strip and
380 when directed by the Engineer. Remove curing compound
381 mechanically in areas where there will be pavement markings.

382 The test strip for the "regular" PCC concrete shall be 100 feet long;
383 the paving width for the test strip shall be the same as that intended
384 by the Contractor for production work.

385 The test strip for the “irregular” shaped pieces, i.e., the concrete
386 pavement design that requires additional reinforcement, e.g.,
387 reinforcing steel, structural macro fibers, GRF, etc. to be used shall
388 be a minimum of 6-feet by 81-feet long. The shape of the “irregular”
389 shape pieces shall mimic the shapes that will be encountered on the
390 project. The Engineer may change the shape and size of this test
391 strip. The test strip for the “irregular” shaped pieces shall use the
392 equipment and material accepted for those types of pours.

393 Meet with the Engineer and the Department staff after the test strips
394 as soon as possible but before the start of the production pour to
395 discuss the “good and bad” of the test strip pour and how the pouring
396 of the concrete pavement could be improved if required. The
397 contractor’s personnel that should attend should be the ones who
398 would make changes if needed. Any changes needed shall be
399 regarded as a no cost, no impact field order and will be considered
400 as part of the Contract Document requirements unless the contractor
401 notifies the Engineer in writing as required by Subsection 104.03
402 Field Orders and if a claim is to be filed comply with Subsection
403 107.15 Disputes and Claims.

404 If in the opinion of the Engineer, the test strip did not demonstrate
405 methods or material that would produce acceptable production PPC
406 pavement additional test strip(s) may be direct to be constructed at
407 no additional cost.

408 The location of the test strips may not be within project limits.

409 After the test strip has cured for 30 days perform a profilograph test
410 to determine the test strip’s smoothness. Submit results to Engineer.
411 Remove the test strip approximately 60 days after completion of the
412 test strip. Restore the test strip area back to its original condition or
413 better. The Engineer may change the duration of how long the test
414 strip shall remain in place. If the Engineer decides to keep the
415 accepted test strip in place, the Contractor in lieu of removal shall do
416 all work needed to make it an acceptable riding surface. In addition,
417 furnish and install permanent pavement markings as required by the
418 Engineer.

419 **(2) General.** Make advance arrangements for preventing delay
420 in concrete delivery and placement. An interval of more than 30
421 minutes between placement of two consecutive batches or loads
422 may constitute cause for stopping paving operations and requiring
423 construction joint to be placed, at no increase in contract price or

424 contract time, at location and of the type ordered by the Engineer.
425 The Contractor's paving plan and concrete mix design if accepted by
426 the Engineer may allow for a larger interval than 30 minutes between
427 two consecutive batches or loads. The Engineer reserves the right
428 not to allow an increase in interval time or limit the amount of
429 increase of the interval time or rescind the change to the interval time
430 if granted, at no increase in cost or contract time. Concrete not
431 placed monolithically at the design thickness, unless specifically
432 allowed by the Contract Documents or Engineer, is defective work
433 and shall be removed.

434 Prior to placing concrete, demonstrate that the proper adjustment of
435 screeds, floats, slip-form pavers, or any other equipment used to
436 level the concrete to its finish grade by measurements from grade
437 stakes or lines set to known elevations or the accepted grade
438 controls has taken place. Placement of concrete shall not start until
439 this is done. Demonstrate satisfactory operation and adjustments of
440 propulsion and control equipment, including pre-erected grade and
441 alignment lines, by running slip-form pavers and finishing machines
442 over 500-foot length of prepared subgrade or base course with
443 propulsion and control equipment fully operational and loaded.

444 Unless otherwise indicated in the Contract Documents, construct
445 pavement in full-lane widths separated by longitudinal weakened
446 plane joints, or monolithically in multiples of full-lane widths, with
447 longitudinal weakened plane joints at approximately each traffic lane
448 line. Deposit concrete with a minimum of handling and keep the
449 concrete pile at a uniform height. The paver shall push a roll of
450 concrete about 6 inches high ahead of the strike off so no low areas
451 with deficient density result. On super-elevated sections, the roll
452 shall be about 12 inches high. The roll of the concrete should
453 approximately have a uniform height and width.

454 The correct thickness of concrete shall be checked at three or more
455 points perpendicular to the centerline across the slab width and
456 twice, evenly spaced, between each location of the soon to be sawed
457 transverse joints, i.e., twice per panel. A finishing bridge shall be
458 used to take measurements.

459 Maintain a uniform concrete slump truck load to truck load. Keep
460 slump within 1-inch+/- load to load for formed concrete, slip-formed
461 concrete within 0.125-inch. Spread concrete uniformly over entire
462 area between forms, without segregation, using mechanical
463 spreader. Pay attention to placing the concrete at consistent height

464 in front of the spreader. Low slump concrete, less than or equal to
465 1-inch slump, is used, the paver has a tendency to float up above the
466 desired grade. If the concrete slump is in that range measures shall
467 be employed to ensure that the paver maintains the required grade.
468 State measures in paving plan.

469 Where hand methods are necessary due to pavement design,
470 equipment breakdown, or other factors, use shovels, not rakes, for
471 hand spreading. Place concrete continuously between transverse
472 joints without using intermediate bulkheads. Prohibit workers from
473 walking in concrete once the spreader has performed its work and
474 no worker shall walk in the concrete with boots or shoes coated with
475 earth or foreign substances.

476 Improperly proportioned concrete or concrete having a temperature
477 exceeding 90 degrees F shall not be used. Remove and dispose of
478 concrete not meeting requirements in accordance with Subsection
479 106.08 Non-Conforming Materials and Subsection 201.03(F)
480 - Removal and Disposal of Material, at no increase in contract price
481 or contract time. Investigate and review incident of non-compliance.
482 Propose and justify adjustments as needed to the work, do not
483 proceed with PCC placement until the Engineer accepts the
484 proposed changes. If proposed changes are accepted by the
485 Engineer incorporate them into the paving plan.

486 Spread, consolidate, and shape concrete so that completed
487 pavement will comply to thickness and cross-sectional requirements
488 indicated in the contract documents. Sides of pavement may be
489 constructed with batter not exceeding one horizontal to six vertical,
490 provided the batter is specified and the pavement top width is
491 maintained as indicated in the Contract Documents.

492 Where widening PCC pavement contiguous with existing parallel
493 concrete or an asphalt pavement not constructed as part of the
494 Contract, spread, consolidate, and shape concrete so that completed
495 PCC pavement will comply to thickness and cross-sectional
496 requirements indicated in the Contract Documents and to the
497 following:

498 (a) Elevation of completed pavement surface shall be such
499 that water will not pond on either side of longitudinal joint with
500 the adjoining pavement.

501 (b) New pavement surface at longitudinal joint shall
502 conform to elevation of adjoining concrete pavement. If

503 necessary, provide smooth transition between new and
504 adjoining pavement by hand finishing new pavement within one
505 foot of adjoining pavement, adding or removing concrete, as
506 necessary or use method as directed by the Engineer.

507 **(c)** Transverse straightedge, longitudinal straightedge,
508 and Profile Index requirements specified in Subsection
509 411.03(M) - Final Strike-Off, Consolidation, and Finishing and
510 Subsection 411.03(N) - Surface Test will not apply to pavement
511 surface within 1-foot of existing concrete pavement unless in
512 the sole opinion of the Engineer the surface finish of the project
513 installed concrete pavement exhibits poor workmanship, e.g.,
514 finished surface is rougher than existing surface, roughness of
515 surface cannot be attributed to the existing concrete pavement.

516 **(d)** Profiles of completed pavement surface specified in
517 Subsection 411.03(N) - Surface Test will not be required within
518 four feet of longitudinal contact joint with adjoining concrete
519 pavement existing prior to construction unless in the opinion of
520 the Engineer the surface finish of the installed concrete
521 pavement exhibits poor workmanship, e.g., finished surface is
522 rougher than existing surface, roughness of surface cannot be
523 attributed to the existing concrete pavement.

524 **(e)** Thickness measurements specified in Subsection
525 411.03(T) - Pavement Thickness will not be made in pavement
526 within one foot of adjoining existing concrete pavement.

527 **(f)** Transverse weakened plane joints shall be constructed
528 in pavement widening to match spacing and skew of weakened
529 plane joints in existing pavement.

530 **(g)** Saw cutting of the pavement shall be parallel to
531 weaken plane joints.

532 Where concrete is to be placed adjacent to pavement previously
533 constructed on the project, keep mechanical equipment off
534 previously constructed pavement until that concrete pavement has
535 attained flexural strength of not less than 550 pounds per square inch
536 when tested in accordance with AASHTO T 97.

537 Where concrete is being placed adjacent to or adjoining existing
538 pavement, provide that part of equipment supported on existing
539 pavement, with protective pads on crawler tracks or rubber-tired
540 wheels; and offset bearing surface to run a sufficient distance from

541 the adjoining existing pavement edge to avoid breaking or cracking
542 that edge or change of its elevation.

543 Repair any damage caused by the Contractor's equipment to any
544 concrete pavement or HMA pavement or anything meant to remain
545 after the project is over; using a means and method submitted and
546 found acceptable by the Engineer.

547 **(3) Stationary Side Form Construction.** Provide sufficient
548 quantity of forms so that there shall be no delay due to lack of forms.
549 Spread, consolidate, and shape concrete by one or more machines.
550 Use machines that uniformly distribute and consolidate concrete
551 without segregation, so that completed pavement conforms to cross
552 section indicated in the Contract Document, with minimum
553 handwork.

554 Furnish paving machines in sufficient number and capacity to finish
555 work at rate equal to or greater than that of concrete delivery.

556 Consolidate concrete for the full paving width, using surface or
557 internal vibrators, or by other method of consolidation that produces
558 equivalent results without segregation.

559 Operate vibrators at manufacturer's recommended frequencies
560 based on compatibility with pertinent factors, including but not limited
561 to the following: mix design, concrete slump, paver speed, and
562 vibrator spacing. Vibration amplitude shall be sufficient to be
563 perceptible on concrete surface more than one foot from vibrating
564 element, e.g., air bubbles, ripples in concrete. Test vibration
565 amplitude before each day's use.

566 Do not rest vibrators on or in new pavement or side forms. Connect
567 power to vibrators so that vibration ceases when forward or
568 backward motion of machine is stopped.

569 **(4) Slip Form Construction.** Slip form paving equipment shall
570 spread, consolidate, and screed freshly placed concrete to produce
571 dense, homogeneous pavement, true to cross section and profile,
572 with minimum handwork.

573 Use reference lines outside the finished concrete limits to regulate
574 paver alignment and elevation during concrete placing and finishing
575 operations. Abrupt changes in longitudinal alignment will not be
576 allowed. Limit horizontal deviation to less than 0.1 foot from
577 alignment established by the Contract Documents or accepted by the
578 Engineer.

579 Coordinate operations of mixing, delivering, and the spreading of
580 concrete to allow slip form paving equipment to operate in continuous
581 forward movement. Every effort shall be made to achieve zero
582 stopping and starting to increase pavement smoothness. When
583 paver forward movement is stopped, immediately cease vibrating
584 and tamping operations. Do not apply tractive force to paving
585 machine except that which is controlled from the machine. Check
586 profile of the plastic concrete pavement for a bump that may have
587 been formed due to the stoppage and if found eliminate it.

588 Consolidate concrete for full paving width using high-frequency
589 vibrators. Operate vibrators at manufacturer's recommended
590 frequencies based on compatibility with pertinent factors, including
591 but not limited to the following: mix design, concrete slump, paver
592 speed, and vibrator spacing. Vibration amplitude shall be sufficient
593 to be perceptible on concrete surface along entire length of vibrating
594 units and for a distance of at least one foot there from. Test vibration
595 amplitude before each day's use. Vibrators shall be positioned next
596 to one another such that their influence zones overlap by about 2 to
597 3 inches at normal paver speeds. Insufficient overlap of the influence
598 zones caused by incorrect vibrator settings or excessively fast paver
599 operation can cause segregation or vibrator trails. Do not allow
600 vibrator trails to form, if they do appear stop paving operations adjust
601 vibrators or paver speed or use other means necessary to correct
602 the problem. Pavement with vibrator trails shall be removed or a
603 remedial repair shall be made that is acceptable to the Engineer.

604 **(J) Test Specimens.** Furnish concrete necessary for casting test
605 beams and cylinders and for testing air and slump. Unless otherwise
606 indicated in the Contract Documents, furnish, maintain, and clean beams or
607 cylinder molds, or both. Beams or cylinder molds, or both shall comply to
608 AASHTO T 23. Cure beams, as specified for pavement, in accordance with
609 AASHTO T 23. For early opening to traffic, cure flexural test specimens at
610 same time and in same manner as pavement.

611 Additional flexural strength test specimens will be required due to concrete
612 placement conditions or to determine concrete strength where early
613 opening of pavement to traffic is dependent on concrete strength test
614 results.

615 **(K) Striking-Off Concrete and Placing Reinforcing Steel.** After
616 placement, strike off concrete to cross section indicated in the Contract
617 Documents.

618 Where pavement is placed in two layers, strike off and consolidate bottom
619 layer to depth necessary to place fabric or reinforcing steel mat directly on
620 concrete. Support reinforcing steel as needed to maintain its correct
621 position. Submit with paving plan the means and methods to be used to
622 maintain the fabric or reinforcing steel mat's correct location and elevation.

623 Place top layer within 30 minutes of first layer or remove and replace lower
624 layer with freshly mixed concrete. The Contractor's paving plan and
625 concrete mix design if accepted by the Engineer may allow for a larger
626 interval than 30 minutes between two consecutive batches or loads. The
627 Engineer reserves the right not to allow an increase in interval time or limit
628 the amount of increase in interval time as well as rescind the change to the
629 interval time if granted at no increase in cost or contract time.

630 Where pavement is placed in one layer, position reinforcing steel before
631 placing concrete.

632 For reinforcing steel, Subsection 602.03(B) - Storage, Surface Condition,
633 and Protection of Reinforcement shall apply.

634 **(L) Joints.** Construct joint faces normal to pavement surface, as
635 indicated in the Contract Documents. Use chalk line, string line, sawing
636 template, or other methods to provide true joint alignment. Prior to contract
637 acceptance, maintain joints free of soil, gravel, concrete or asphalt mix, and
638 other foreign material except for filler material.

639 Where sawing method is used to cut pavement grooves, use saw complying
640 to Subsection 411.03(B)(4) - Concrete Saw. Saw joints with an early-entry
641 concrete saw before uncontrolled shrinkage cracking occurs, but only after
642 concrete has hardened sufficiently to prevent excessive tearing or raveling,
643 or both during sawing operations. All early-entry concrete saws shall have
644 special blades that will allow the cutting to start earlier and cut through
645 relatively fresh concrete without needing water. Determining concrete
646 readiness for sawing transverse contraction and longitudinal joints in
647 accordance with requirements specified herein shall be the Contractor's
648 responsibility. Cut grooves to minimum width possible for type of saw used,
649 but limit groove width to 0.02 foot.

650 Once sawing has commenced for any day's concrete placement, continue
651 sawing for 12 hours after start of placement. Should sawing fail to be
652 completed within 12 hours start of concrete placement, limit subsequent
653 concrete placements to quantities that can be sawed in 12 hours or increase
654 the number of saws being used cutting joints. Spray two coats of curing
655 compound on each side of the joint's cut vertical face immediately after
656 sawing the joint and removal of the concrete cutting slurry. Each coat of the

657 curing compound shall be applied in an opposite direction of the previous.
658 Remove slurry residue before spraying curing compound

659 If there are restrictions on night work decrease amount of concrete placed
660 or increase the number of saws or use other methods to complete
661 placement of concrete and saw cutting the joints during daylight hours.

662 **(1) Longitudinal Joints.** Place deformed tie bars, two-piece
663 connectors accepted by the Engineer, and smooth dowels, as
664 indicated in the contract documents, perpendicular to longitudinal
665 joint. Deformed tie bars and two-piece connectors shall be 30 inches
666 long, Grade 60 No. 5 bars, placed 30 inches apart at mid-depth of
667 slab. Where deformed tie bars are to be bent and later straightened,
668 use Grade 40 bars, use of Grade 60 bars shall not be allowed. Bend
669 the Grade 40 bars only once. Place bars using mechanical
670 equipment, or secure bars with chairs or other supports in
671 accordance with Section 602 - Reinforcing Steel. Use other required
672 sizes, grades, lengths, and spacings, based on slab width, thickness,
673 and type of underlying base. If more than three lanes or two lanes
674 and a shoulder is to be constructed the Engineer will change from
675 the use of a deformed bar to another load transfer device.

676 Apply curing to the joints face if curing is still required. For formed
677 joints apply curing after forms are removed if curing is still required.

678 Unless otherwise indicated in the Contract Documents, tie bars may
679 be inserted into plastic concrete. If this method results in tie bar
680 misalignment, or poor consolidation around tie bars, or concrete
681 surface or edge slumping, or combination thereof, discontinue using
682 this method and complete work using other methods accepted by the
683 Engineer.

684 Construct longitudinal joints by sawing method at traffic lane lines in
685 multilane, monolithic concrete pavement. Cut longitudinal joint to
686 minimum depth $d = t/3$, where:

687 d = minimum depth of cut, rounded up to nearest 0.01 foot;

688 t = greatest pavement thickness (feet) in each lane.

689 Where adjacent lanes are constructed separately, use deformed tie
690 bars or smooth dowels, as indicated in the contract documents. Two-
691 piece connectors accepted by the Engineer may be used.

692 Clean all joint faces of any curing compound, primer or any material
693 that may be deleterious to the bonding of the new concrete to the
694 existing or previously poured concrete.

695 Patch all voids in the face of the longitudinal joint. Modify placement
696 means and methods to minimize voids in the face of the longitudinal
697 joint. The Engineer may require removal of the concrete with the
698 voids up to the entire panel it occurs in if the voids have the potential
699 in the sole opinion of the Engineer to have an impact on the service
700 life of the concrete pavement.

701 Minimize the occurrence of joints being in the same location as
702 pavement markings.

703 **(2) Transverse Expansion Joints.** Extend transverse
704 expansion joint to full cross section of PCC pavement and install
705 continuous piece of preformed joint material. Install joint filler ½-inch
706 below pavement surface.

707 Hold expansion joint filler in vertical position and limit deviation to not
708 more than ¼-inch from straight line along centerline of joint. Hold
709 filler on line with metal channel. Remove channel after initial
710 concrete set.

711 **(3) Transverse Contraction Joints.** Construct transverse
712 contraction joints by forming or sawing grooves in pavement surface
713 for the pavement's entire width. Where indicated in the Contract
714 Documents, include dowel bars and basket assemblies.

715 Transverse contraction joints may be formed by depressing tool or
716 device into plastic concrete before initial concrete set.

717 Where transverse cracking occurs prior to sawing and any point on
718 the crack is within 5 feet of planned transverse contraction joint, omit
719 sawing planned joint.

720 If uncontrolled shrinkage cracking occurred during or before joint
721 sawing, modify means and method to eliminate uncontrolled
722 shrinkage cracking before next concrete pavement pour. Submit
723 change for review for acceptance by the Engineer before use. Do
724 not continue of any PCC pavement until written acceptance by the
725 Engineer is given. Incorporate changes into paving plan.

726 Unless otherwise indicated in the Contract Documents, construct
727 groove between depths of 1/3 to 1/4 of pavement thickness.

728 Spray two coats of curing compound on each side of the joint's cut
729 vertical face immediately after sawing the joint. Each coat of the
730 curing compound shall be applied in an opposite direction of the
731 previous. Remove slurry residue before spraying curing compound.

732 **(4) Construction Joints.** When concrete placement is
733 interrupted for more than 30 minutes, or concrete has started to
734 harden, loss of plasticity or achieved initial set. Construct
735 longitudinal and transverse construction joints in accordance with the
736 Contract Documents, unless receiving a waiver to this requirement
737 from the Engineer. Placement of construction joint within 10 feet of
738 another transverse joint will not be allowed. At time of interruption, if
739 sufficient concrete has not been mixed to form slab greater than 10
740 feet long that meets the finish elevation, remove and dispose of
741 concrete back to preceding joint that meets the finish elevation, at no
742 increase in contract price or contract time. When concrete
743 placement is stopped, provide bulkhead having sufficient
744 cross-sectional area to prevent deflection, notched to receive
745 dowels, and shaped to pavement cross section. Bulkhead shall be
746 placed perpendicular to the baseline and shall also be one straight
747 piece across the entire width of the pavement being poured. Check
748 with 12-foot straight edge perpendicular to construction joint to
749 ensure there is no sagging of the placed concrete from the trueness
750 or deviation from the finish elevation.

751 When placement of concrete pavement resumes from the
752 construction joints test the harden and plastic concrete surfaces'
753 profile for trueness using 12-foot straightedge swung from handle
754 that is 3 feet longer than one-half of slab width. Hold straightedge in
755 contact with the harden and plastic concrete surface at the same
756 time, in successive positions parallel or perpendicular to road
757 centerline depending on what type of joint is being checked. Test
758 entire pavement width or length, moving from one side of slab to the
759 other, as necessary.

760 **(5) Dowels for Longitudinal, Transverse, Expansion, and**
761 **Contraction Joints.** As indicated in the Contract Documents,
762 provide smooth, straight dowels, complying to Subsection 709.01(E)
763 - Dowels; and deformed dowels complying to Subsection 709.01(F)
764 - Tie Bars. Minimum diameter of the dowels shall be 1-1/2-inches.

765 At transverse joints, space dowels in pavement at one-foot centers,
766 parallel to pavement surface and traffic direction.

767 Use joint assemblies or wire baskets anchored firmly in place, that
768 shall remain in pavement to hold dowels in place during concrete
769 placement and finishing. For referencing for joint placement,
770 properly mark center of dowel assembly on both sides of pavement
771 slab.

772 For expansion joints, unless otherwise indicated in the Contract
773 Documents, use dowels with one end of each coated dowel encased
774 in cap complying to Subsection 709.01(E)(2) - Joint Dowels.

775 Place dowels in pavement with alignment tolerance of $\pm 1/4$ inch per
776 dowel and depth $d = t/2$, where:

777 $d =$ minimum depth, rounded up to nearest 0.01 foot;

778 $t =$ pavement thickness (feet) in each lane.

779 Maintain dowel position and arrangement when placing and
780 consolidating concrete around dowels. Anchor wire baskets so
781 dowels do not move. Cut tie wire if required by the Engineer.

782 Unless otherwise indicated in the Contract Documents, coat entire
783 length of each dowel with de-bonding material accepted by the
784 Engineer. Use of cutback asphalts, emulsions, or oils will not be
785 allowed for coatings.

786 **(M) Final Strike-Off, Consolidation, and Finishing.**

787 **(1) Sequence.** Sequence operations as follows: strike-off,
788 consolidate, float, remove laitance, straightedge, and perform final
789 surface finish and texturizing. Provide work bridges and other
790 equipment necessary to reach pavement surface to inspect,
791 straightedge, finish, and perform corrective work as necessary.

792 Finish concrete surface without adding water to surface.

793 **(2) Finishing at Joints.** Strike-off, consolidate, and finish, in a
794 manner that does not damage or misalign, or both, joint assemblies,
795 load transfer devices, and other embedded items. Vibrate concrete
796 mechanically next to joints eliminating voids or segregation, or both
797 without creating voids or segregation, or both.

798 If finishing operation causes segregation, damage, or joint
799 misalignment, or combination thereof, stop finishing equipment when
800 screed is approximately 8-inches from joint. Remove segregated
801 concrete surrounding joint. Lift front screed and set it directly over
802 joint before continuing forward motion. Lift and carry second screed
803 over joint when it is close enough to force excess mortar over joint.
804 If segregation is prevented, subsequent finishing over joint without
805 lifting screeds will be allowed.

806 **(3) Machine Finishing.** Set up finishing equipment in a manner
807 that minimizes the amount of hand work and floating.

808 **(a) Nonvibratory Method.** Use finishing equipment to
809 strike off, screed, and texture concrete immediately after it is
810 distributed or spread. Avoid excessive finishing. Keep top of
811 forms free of concrete and debris.

812 Maintain a ridge of concrete uniform in height along
813 entire paving width and ahead of screed during first pass of
814 finishing machine.

815 **(b) Vibratory Method.** Vibrators for full-width vibration of
816 concrete paving slabs shall comply to Subsection
817 411.03(B)(3)(b) - Vibrators. When uniform and satisfactory
818 concrete density is not obtained by vibratory method, furnish
819 other equipment and methods that produce pavement
820 complying to the Contract Documents. Where not in conflict
821 with provisions in Subsection 411.03(M)(3)(a) – Nonvibratory
822 Method, provisions for vibratory method, shall govern.

823 **(4) Hand Finishing.** Use hand-finishing methods only under the
824 following conditions and locations:

825 **(a)** When mechanical equipment breaks down, stop
826 concrete placement and hand-finish concrete already in
827 place, if there is enough concrete in place to meet joint
828 requirements and finish elevation.

829 **(b)** In areas of narrow widths or irregular shapes,
830 hand-finish those areas when those areas cannot be finished
831 by mechanical equipment.

832 **(c)** Hand floating or hand-finishing is required in other
833 portions of the pavement is required to be performed by the
834 Contract Documents.

835 Use portable screed to strike-off and screed concrete. Provide
836 second portable screed to strike-off bottom concrete layer when
837 placing reinforcing steel during two-layer concrete placement.

838 Use metal screed or metal-reinforced screed; that is at least 2 feet
839 longer than widest part of slab to be placed.

840 Consolidate concrete with hand-operated vibrator.

841 Move screed along forms in forward motion that combines
842 longitudinal and transverse shearing motion without raising either
843 end from side forms. Repeat this strike-off process until pavement
844 is true to grade and cross section, and surface texture is uniform and
845 free of porous areas.

846 (5) **Floating.** After striking off and consolidating concrete, use
847 float to finish surface to specified grade and smoothness. Use one
848 of the following methods:

849 (a) **Hand Method.** Use hand-operated longitudinal float
850 and work the float in sawing motion going in a longitudinal
851 direction that is parallel to road centerline. Move the float after
852 each pass gradually from one side of pavement to the other
853 so that the entire area of the poured concrete pavement is
854 floated. The longitudinal float's blade shall have a minimum
855 dimension of 12-feet long and 6-inches wide and sufficiently
856 rigid to retain its shape and provide a smooth finish. Operate
857 longitudinal float from footbridges. Move ahead along
858 pavement centerline, advancing not more than one-half of
859 float length. Waste excess water and laitance over forms on
860 each pass. Check all longitudinal floats for straightness,
861 warpage and damage before each shift they are used.

862 (b) **Mechanical Method.** Adjust tracks and float to
863 required crown. Coordinate float with adjustments of
864 transverse finishing machine so that small quantity of mortar
865 is maintained ahead of float. Operate float over pavement as
866 few times as possible and at such intervals as is necessary to
867 produce surface of uniform texture. An excessive floating
868 operation over a given area will not be allowed. Waste excess
869 water and laitance over side forms on each pass.

870 (c) **Alternate Mechanical Method.** Use equipment with
871 cutting and smoothing float or floats, suspended from and
872 guided by rigid frame mounted on four or more visible wheels.
873 Maintain constant contact of all four wheels with forms.

874 After mechanical floating; use hand method to fill
875 open-textured areas in pavement or if the method does not
876 provide an acceptable finish. If method provides surface
877 finishing that is not satisfactory to the Engineer and continues
878 to do so after adjustments to the method, it shall be replaced
879 when requested by the Engineer.

880 (d) **Slip-Form Finishing.** Construct pavement with
881 preliminary float finish using devices incorporated in slip-form
882 paver. Suitable machine floats may be used to supplement
883 finish achieved by slip-form paver.

884 Before concrete has hardened, correct pavement edge
885 slump, or drop, or edge rounding, in excess of 0.01 foot.

886 **(6) Evaporation Retarders and Finishing Aid Solutions.**
887 Evaporation retarders and finishing aid solutions may be used.
888 Adjust dilution rates to fit local climate. Evaporation retarders and
889 finishing aids shall not be used interchangeably, using them
890 interchangeably will damage the concrete surface and shall be cause
891 for the pavement being non-compliant and shall be removed or an
892 Engineer accepted remedial repair be performed. The Engineer will
893 solely decide what method is to be used.

894 **(7) Straightedge Testing and Surface Correction.** After
895 completing floating and removing excess water and laitance; correct
896 surface irregularities while concrete is plastic. Fill, strike-off,
897 consolidate, and refinish depressions. Utilize a “bump cutter” with a
898 12-foot long blade and with straightening-rod system to shape plastic
899 concrete. Cut down and refinish high areas. Smooth surface across
900 joints to tolerances indicated in the Contract Documents.

901 Test concrete surface for trueness using 12-foot straightedge swung
902 from handle that is 3 feet longer than one-half of slab width. Hold
903 straightedge in contact with surface in successive positions parallel
904 and perpendicular to road centerline. Test entire width of pavement
905 surface, moving from one side of slab to the other, as necessary.
906 Advance testing operation along road, in successive stages of not
907 more than one-half straightedge length.

908 **(8) Final Finish.** After surface sheen has disappeared; texture
909 pavement surface without tearing it. Texture final surface using
910 artificial turf drag followed immediately by metal comb grooving
911 device.

912 Use artificial turf made of molded polyethylene with synthetic turn
913 blades measuring approximately 0.85 inches long and containing
914 approximately 7,200 individual blades per square foot. Submit
915 sample of artificial turf at least ten working days before placing PCC
916 pavement.

917 Attach artificial turf to self-propelled equipment having external
918 alignment control. Device shall be separate piece of equipment to
919 be used exclusively for texturing operation and shall not be attached
920 to another paving-train equipment. Artificial turf shall be full
921 pavement width and of sufficient size that during finishing operation,
922 approximately 2 feet of turf, parallel to pavement centerline, is in

923 constant contact with pavement surface. Maintain downward
924 pressure on pavement surface with turf, to achieve uniform texturing
925 without measurable variations in pavement profile. The artificial turf
926 drag shall not be wavy and shall be parallel to the center line of the
927 pavement.

928 In addition to the artificial turf drag, grooving (tining) shall be done
929 immediately after the artificial turf drag is performed by a
930 self-propelled mechanical device (grooving device) having an
931 external alignment control and capable of grooving the entire width
932 of pavement being paved in single pass at uniform speed. The
933 grooving device shall be a separate piece of self-propelled
934 equipment to be used exclusively for texturing operation and shall
935 not be attached to another paving-train equipment. The metal comb
936 which creates the tining marks shall include a single line of evenly
937 spaced, tempered spring steel tines of size and stiffness sufficient to
938 produce grooves of specified dimensions in plastic concrete without
939 edge slumping and severe surface tearing. Operate grooving device
940 to produce a uniform pattern of grooves parallel to pavement
941 centerline. The tines shall not be left in the concrete when the tining
942 machine stops. The tines shall be lifted off the concrete and then
943 lowered down again when forward motion resumes. Leaving the
944 tines in the fresh concrete can leave an indentation in the surface
945 which shall not be allowed. Attach metal comb to mechanical device
946 capable of traversing entire pavement width in single pass at uniform
947 speed. Grooves shall have in the harden pavement surface a
948 minimum spacing of 0.75 inch. Grooves shall be 0.125 -inch wide by
949 0.125-inch deep. Provide hand combs with steel tines to use in event
950 of mechanical comb breakdown.

951 Ramps, tapers, and miscellaneous areas may be textured manually
952 when requested from the Engineer. Indicate in paving plan areas
953 that will be manually textured.

954 **(9) Edging at Forms and Joints.** After final finish, tool pavement
955 edges to radius of 1/4 inch, along both sides of each slab; and on
956 both sides of transverse expansion joints, formed joints, and
957 construction joints. Produce smooth, dense mortar finish.

958 Eliminate tool marks on slab, next to joints. Avoid disturbing
959 rounding of slab corners. Remove concrete from joint filler top.

960 Before concrete sets, test joints with straightedge and correct
961 unevenness between joints and adjacent slabs.

962 **(N) Surface Test.** Perform surface profile tests frequently to
963 ensure that the means and methods being used produces pavement that is
964 compliant with the Contract Document's surface profile smoothness
965 requirement. Make every effort to perform surface tests before opening
966 pavement to the public. Test the pavement surface for smoothness with a
967 12-foot-long straightedge, a 12-foot-long rolling straightedge, or a California
968 Type Profilograph. The finished pavement shall comply to all the following
969 requirements:

970 **(1) Terms, Abbreviations, and Definitions.** The following
971 definitions shall be used for this section and related areas of work. It
972 is meant to work in conjunction with Section 101 Terms,
973 Abbreviations, and Definitions. Should a conflict arise Subsection
974 105.05 Interpretations of the Contract Documents; Conflicts and
975 Ambiguity shall apply.

976 **(a) Blanking Band -** A band of uniform height with its
977 longitudinal center positioned optimally between the highs and
978 lows of the surface record depicting at least 0.10 mile of
979 pavement.

980 **(b) Deficiency –** An area that exceeds the required profile
981 index or exceeds the requirement for a manual or rolling
982 straightedge, a scallop or spike or bump or dip in the pavement.

983 **(c) Profile Index –** Inches per mile in excess of the blanking
984 band. This determines the pavement or road smoothness.

985 **(d) Profile index scale,** transparent plastic scale 1.70-inch
986 x 21.12 inch representing a scaled pavement length of 0.10 mile.
987 The center of the scale shall be a 0.2-inch opaque 'blanking'
988 band that extends the length of the scale. On both sides of this
989 band are lines scribed 0.1 inch apart, parallel to the centerline of
990 the scale, serving as a scale to measure deviations of the
991 profilogram above and below the blanking band.

992 **(e) Profilogram,** scaled with 1 inch equal to 25 ft.
993 longitudinally and 1 inch equal to 1 inch vertically.

994 **(f) Profilograph,** California-type, constructed with a metal
995 frame with approximately 25-feet between the front and rear
996 wheel assembly supports. It shall allow field calibration using
997 vertical deflection standards. Each wheel assembly consists of
998 six averaging rubber-tired wheels arranged so the center of the
999 frame represents the mean evaluation of the road surface
1000 between the wheel assemblies. For consistent graph recording,

1001 maintain air pressure in the profile wheel to the manufacturer's
1002 specification. Propulsion power may be manual, or a small
1003 propulsion unit attached to assembly may be used.

1004 Example of commercially available profilographs

1005 (i) Cox Automated Profilograph

1006 (ii) Ames Automated Profilograph

1007 (iii) McCracken Automated Profilograph.

1008 (g) Scallop - A vertical projection above or below the
1009 blanking band.

1010 (h) Spike - A scallop with a width of less than 0.08 inch on
1011 the profilograph. (about 2 feet on the roadway).

1012 **(2) Surface Test Using 12-Foot Manual Straightedge** At
1013 locations determined by the Engineer and Contract Documents use
1014 a 12-foot manual straightedge. When the straightedge is laid on
1015 finished pavement in direction parallel or normal to centerline as
1016 determined by the Engineer, the 12-foot manual straightedge surface
1017 shall not vary more than 1/8 inch from lower edge in any direction.
1018 Perform the profiling in lines at a distance determined by the
1019 Engineer, but at not less than one foot on center or more than a four
1020 foot on center spacing. Profiling shall extend across the transverse
1021 joints when they are located within testing area. The Engineer may
1022 decrease the spacing of the surface test to verify the limits of an
1023 irregularity of a surface determined by the Contactor. Check the
1024 following with a 12-foot Straightedge:

1025 (a) Construction joints where a day's paving ended and
1026 another day's began.

1027 (b) Longitudinal profiling parallel to centerline, when within
1028 15 feet of a bridge approach or existing pavement (pavement
1029 not constructed under the current project) which is being joined.

1030 (c) Transverse profiling of cross slopes, approaches, and
1031 as otherwise directed with respect to the requirements below:

1032 1. Lay the straightedge in a direction perpendicular to the
1033 centerline.

1034 2. When pavement abuts bridge approaches or pavement
1035 not under this Contract, ensure that the longitudinal slope

1036 deviations of the finished pavement comply with Contract
1037 Document's requirements.

1038 3. Short pavement sections up to 250 feet long, including
1039 both mainline and non-mainline sections on tangent
1040 sections and on horizontal curves with a centerline radius
1041 of curve less than 1,000 feet.

1042 4. Within a superelevation transition on horizontal curves
1043 having centerline curve radius less than 1,000 feet, e.g.,
1044 curves, turn lanes, ramps, tapers, and other non-mainline
1045 pavements.

1046 5. Within 15 feet of transverse joint that separates
1047 pavement from existing pavement not constructed under
1048 the contract, or from structural bridge deck or approach
1049 slab for longitudinal profiling,

1050 6. As otherwise directed by the Engineer.

1051 (d) The Engineer may confine the checking of through
1052 traffic lanes with the straightedge to joints and obvious
1053 irregularities.

1054 (3) **Surface Test Using 12-Foot Rolling Straightedge** In lieu
1055 of using a 12-foot manual straightedge the contractor may use a
1056 12-foot rolling straightedge, California-type profilograph or other
1057 roadway profiling device upon acceptance by the Engineer. The
1058 Engineer, however, is under no obligation to provide such a waiver
1059 and may place limitations to their use if accepted.

1060 (4) **Surface Test Using California-type Profilograph** In all
1061 areas not listed to be measured by the 12-foot manual straightedge
1062 a California-type profilograph shall be used unless otherwise
1063 directed by the Engineer. To determine the profile for each lane of
1064 pavement surface use the California-type profilograph in accordance
1065 with HDOT TM 6 and these specifications.

1066 (a) HDOT TM 6 shall be modified in the following way:

1067 1. Electronic recorder shall be used. The electronic
1068 recorder shall:

1069 i. Collect data by means of a digital response
1070 resulting from the vertical movement of the profile
1071 wheel.

1072
1073
1074
1075
1076
1077
1078
1079
1080
1081
1082
1083
1084
1085
1086
1087
1088
1089
1090
1091
1092
1093
1094
1095
1096
1097
1098
1099
1100
1101
1102
1103
1104
1105
1106

- ii. Record the data digitally and shall be able to produce a hard copy profilogram on a scale of 1 in. = 25 ft longitudinally and 1 in. = 1 in. vertically (full scale).
- 2. The profilograph shall have a software program capable of generating a computerized profile trace based on the collected data. The computer software shall be set with the following data filter settings.
 - i. Filter Type: 3rd Order Butterworth
 - ii. Filter Length: 2.0 feet
 - iii. Filter Grain: 1.00
 - iv. Blanking Band: Zero
 - v. Bump Locator: On
 - vi. Bump Checkbox: Check
 - vii. Dip Checkbox: Check
 - viii. Bottom Bump: Off
- 3. Movement of the profilograph may be provided by manually propelling the profilograph.
- 4. A golf cart or other similar type lightweight vehicles may be used to provided propulsion. It shall operate at the slow rate speed required, be able to maintain a constant speed and it shall not adversely affect the operation or function of the profilograph in any manner.
 - i. The propulsion unit shall not be used to push the profilograph from behind.
 - ii. The propulsion unit shall be use at a speed not to exceed 3 miles per hour or walking speed. Reduce speed if speed adversely affects the operation or function of the profilograph in any manner.
 - iii. Use the profilograph manufacturer’s recommendation for attaching propulsion unit to profilograph.
- 4. Provide the use the propulsion unit with operator to the Engineer for its profile check.

1107
1108
1109
1110
1111
1112
1113
1114
1115
1116
1117
1118
1119
1120
1121
1122
1123
1124
1125
1126
1127
1128
1129
1130
1131
1132
1133
1134
1135
1136
1137
1138
1139
1140
1141

(5) Submission of Profile Reports

(a) Submit the daily reports and analysis of the day's profiling within three working days of the profile test.

1. Profilograms that report smoothness that fails to meet the Contact Document's requirements shall be highlighted and noted as such on the transmittal cover sheet.

2. The cause for the contractually non-compliant profile and remedial action, e.g., change of construction method, grinding of pavement, shall be included in the submittal as a separate report and shall be noted and highlighted on the cover sheet.

3. Submit all data files of the final pavement surface profile to the Engineer upon completion of all profile testing in a format, form and storage media determined by the Engineer in one complete submittal.

(b) Until HDOT requires profiling to be done by an inertial profiler, incentive payments will be determined by a California-type profilograph. An incentive payment adjustment schedule in IRI is provided as a non-binding reference only. The PI incentive payment adjustment schedule is the only payment adjustment schedule that will be used to calculate incentive adjustments.

(6) Location of Profile Testing

(a) Take a minimum of two profiles per lane, one profile in each of the two-wheel paths which is located parallel to and three feet from each lane's edge.

(b) The profiles shall be taken in the direction of traffic only.

(c) When the final permanent markings have not been installed at the time of the Department's profile test, mark the pavement so that the location of the wheel paths can be determined and laid out.

(7) Required Road Profile

(a) The profile index using a California-type profilograph shall not exceed 7.0 or equivalent International Roughness Index (profile index).

1142 (b) Where the 12-foot manual straightedge is required to
1143 be used the surface shall not vary more than 1/8 inch from the
1144 lower edge of a straightedge.

1145 (c) Any pavement with a profile index more than 7.0, or
1146 equivalent International Roughness Index (IRI) or has a surface
1147 vary more than 1/8 inch from the lower edge of a straightedge
1148 shall be removed or have a remedial repair performed on it that
1149 is acceptable to the Engineer.

1150 (d) No payment for the non-compliant pavement will be
1151 made or if it has been made, in full or partial amounts, the entire
1152 payment for the area will be deducted from the monthly
1153 payment, unless the area is made to comply with the Contract
1154 Document requirements before the deduction is made.

1155 (e) No payment for the work will be made until the
1156 pavement meets the profile index requirement of 7.0 or manual
1157 straightedge requirement and other Contract Document
1158 requirements.

1159 **(8) Request for Acceptance Profile Testing by the**
1160 **Department**

1161 1. When the pavement surface is determined by the
1162 Contractor to meet the road profile requirements of the
1163 Contract Documents it may make a request to the
1164 Engineer to perform an acceptance profile test.

1165 i. Submit an approximate acceptance profile
1166 testing date and area to be tested with the limits of
1167 the test area in writing. In addition, along with
1168 profilograph test request submit the profilograph
1169 test results of the area to be tested to the
1170 Engineer. The request shall be made at least 60
1171 days before desired testing date.

1172 ii. If the Contractor has not profiled the proposed
1173 test area at the time of request it may delay the
1174 submittal of the profile testing data to no later than
1175 14 days before the date of testing.

1176 iii. No acceptance testing will be made without the
1177 submittal of the Contractor's profilograph test
1178 results or equivalent International Roughness Index
1179 (IRI). Failure to submit the profilograph test results

1180 by the stated deadline or by an Engineer accepted
1181 deadline date will be considered a cancellation of
1182 the acceptance test and the Contractor shall
1183 request another profile test date. Reimburse HDOT
1184 for any incurred cost related to any Contractor
1185 caused cancellation.

1186 **(9) Department Requirements for Acceptance Profile Testing**

1187 **(a)** When a request for testing is made, the requested area
1188 to be tested shall not be less than 25% of the total area
1189 indicated to be paved in the Contract Documents but shall not
1190 be less than 1,500 linear feet of lane to be tested unless the
1191 requirement is waived by the Engineer.

1192 **(b)** Provide labor, equipment and material for the profiling
1193 of the pavement surface by the Engineer. The Engineer may
1194 request in addition to what was initially supplied additional labor,
1195 equipment and material, etc. at no additional cost or increase in
1196 contract time.

1197 **(c)** Clean debris and clear obstructions from area to be
1198 tested, as well as a minimum of 100 feet before and beyond the
1199 area to be tested, before testing starts for staging areas.
1200 Provide traffic control for all pavement profile testing.

1201 **(d)** The Engineer may cancel the profile testing if the test
1202 area is not sufficiently clean, traffic control is unsatisfactory, or
1203 the area is not a safe work environment or test area does not
1204 meet Contract Document requirements, etc. This will count as
1205 one profile test.

1206 **(10) Cost of Acceptance Profile Testing by The Department**

1207 **(a)** The Engineer will perform one initial profile test, at no
1208 cost to the Contractor for each area to be tested.

1209 **(b)** Based on the Engineer's profilogram or pavement
1210 profile, it will be determined if the pavement's smoothness, e.g.,
1211 profile index, International Roughness Index (IRI) is acceptable.

1212 **(c)** If the pavement's smoothness does not meet the
1213 requirements of the Contract Documents the Contractor shall
1214 perform remedial work, then retest the area to ensure that the
1215 area has the required profile index, i.e., smoothness, before
1216 requesting another profilograph test by the Engineer.

1217
1218
1219
1220
1221
1222
1223
1224
1225
1226
1227
1228
1229
1230
1231
1232
1233
1234
1235
1236
1237
1238
1239
1240
1241
1242
1243
1244
1245
1246
1247
1248
1249
1250
1251
1252
1253
1254
1255

1. Additional testing, beyond initial test will be performed at cost to the Contractor of \$2,500 per test and an additional \$3,500 per six-hour day if airline travel or traveling of 25 miles or more is required. Also, an additional cost for mobilization of \$4,500 will be charged for each time equipment is required to be shipped to the location of the test, e.g., from Oahu or another island that the machine is not located on the date of requested profile test. Or a cost for mobilization of \$750 will be charged for each time equipment is required to be shipped to the location project location if the equipment is located on the same island it is located on at the requested test date. Should the additional testing not require airline travel or traveling of 25 miles or more a charge of \$2,000 per six-hour day will be made after the initial test for any retesting and \$2,500 for each additional test.

2. Provide the profilograph machine, if requested inertial profiler, labor and other equipment to operate it or collect profile data, e.g., generator, lights, follow vehicle, computer, printer. Profile testing will be under the supervision of the Engineer and the previously mentioned items shall be for the exclusive use of the Engineer.

3. The Contractor's California-type profilograph machine or inertial profiler, shall be in a condition, type and have features that are acceptable to the Engineer before it can be used for acceptance profiling.

i. Submit catalog cuts of the contractor's California-type profilograph machine or inertial profiler.

ii. Submit a current calibration certificate from an entity acceptable to the Engineer for the profilograph to be used.

4. When the profilograph machine or inertial profiler is found acceptable by the Engineer no equipment mobilization charges will be made for additional tests.

5. Cancellation of a Department acceptance profile test within 14 days of the requested or agreed to test date will

1256 be counted as the initial test of the area and all profile
1257 testing for that area shall be at additional cost to the
1258 Contractor.

1259 **(11) Pavement Profiling Testing**

1260 **(a)** During the initial paving operations or after a long break
1261 from placing pavement perform a profile test when the newly
1262 placed pavement has cured sufficiently to allow profile testing.

1263 **(b)** Test pavement surface using California-type
1264 profilograph, to calculate profile index or other accepted
1265 measuring device. Test pavement surface at least once a week
1266 once pavements are old enough.

1267 1. Use profile testing results to aid in evaluating the
1268 paving method's and equipment's ability to produce
1269 pavement meeting the Contract Documents'
1270 requirements.

1271 2. Submit all profile test results with the average profile
1272 index or IRI to the Engineer. Provided other information
1273 when requested.

1274 3. When average profile index or IRI equivalent exceeds
1275 10 inches per mile, suspend paving operations.

1276 i. Resumption of paving operations shall not occur
1277 until corrective action to the paving plan, which may
1278 include the paving method, is submitted to the
1279 Engineer and accepted.

1280 4. Profile test area where corrective action to the
1281 paving plan has taken place. Verify that area is in
1282 accordance with Contract Document
1283 requirements. If the area has a profile index or IRI
1284 equivalent that still exceeds 10 inches per mile,
1285 suspend paving operations again and re-revise
1286 the corrective paving plan.

1287 5. Repair curing membrane on concrete pavement if
1288 damaged during surface remediation and testing
1289 operations if curing is still required. Apply curing
1290 if new cementitious repair material is placed.

1291 **(c)** Maintain slopes as shown in the Contract Documents.
1292 Slopes not meeting the slopes in the Contract Documents or
1293 the accepted road profiles will be considered a deficiency and

1294 non-compliant. Remove non-compliant area or submit for
1295 review and acceptance by the Engineer a remedial work plan to
1296 correct the deficiency.

1297 **(12) Furnish, Operate and Maintain the Straightedge.**

1298 **(a)** Manual straightedges shall be constructed of
1299 aluminum or other lightweight metal and shall have blades of
1300 box or box-girder cross section with a flat bottom reinforced to
1301 ensure rigidity and accuracy. They shall be used for all types
1302 of paving and the checking of a cold-milled surfaces.

1303 1. The manual straightedge should be 12 feet \pm 2 inches
1304 in length, rigid and in good working order.

1305 2. When suspended at the end points its measurement
1306 edge shall not deviate from a true plane by more than 0.02
1307 inch at any point above or below the true plane. The
1308 manual straightedge shall be rigid enough not to deform or
1309 sag when suspended at the ends.

1310 3. The manual straightedge shall also be straight along its
1311 length and shall not deviate from straight horizontal axis
1312 down the middle of the straight edge by more than 0.06
1313 inch.

1314 4. Manual Straightedges shall have handles to facilitate
1315 movement on pavement or other methods to facilitate
1316 movement.

1317 5. Screeds are not acceptable as a manual straightedge.

1318 6. Provide and operate a 12-foot manual straightedge of
1319 a design acceptable to the Engineer, able to accurately
1320 measure surface irregularities that exceed 1/8 inch in a
1321 12-foot effective length of the straightedge.

1322 **(b)** Rolling straightedge - The rolling straightedge should
1323 be 12 feet \pm 2 inches in length measured from center-to-center
1324 of the wheel axles and in a proper working order giving accurate
1325 repeatable results.

1326 1. The rolling straightedge shall have a read-out gauge
1327 with low and high reading marks in 1/16-inch increments
1328 measuring a maximum of 1/4 inch deviation in the
1329 pavement.

1330 2. Provide and operate a 12-foot rolling straightedge of a
1331 design acceptable to the Engineer, able to accurately
1332 measure surface irregularities that exceed 1/8 inch in the
1333 12-foot effective length of the straightedge.

1334 **(13) Calibration of Straightedges**

1335 **(a) Manual Straightedges**

1336 1. Check the manual straightedge with a string line, using
1337 a line that does not sag when pulled taut, e.g., piano wire,
1338 for accuracy. Testing of the straightedge shall be done at
1339 a minimum on a weekly basis or more frequently if it is
1340 suspected that the straightedge may be damaged.

1341 i. A laser could be acceptable providing it could
1342 equal the ability to determine the straightness of the
1343 straightedge to the same degree as piano wire.

1344 2. The edge of the manual straightedge that contacts the
1345 pavement shall not have any vertical deviation more than
1346 0.02 inch.

1347 **(b) Rolling Straightedge**

1348 1. Verify the calibration of the rolling straightedge each
1349 day before the rolling straightedge is used. The following
1350 steps should be used to verify the calibration:

1351 i. Before the beginning of the verification, make
1352 sure the center wheel moves up and down freely.
1353 Make sure all wheels are free of deposits and
1354 contamination and rotate freely.

1355 ii. When tested with a straightedge, ensure that
1356 the finished pavement profile provides a uniform
1357 surface with no deviation greater than 1/8 inch in a
1358 12-foot length. Perform the profiling in lines parallel
1359 to the centerline, at not more than a 4-foot
1360 transversal spacing and extending across the
1361 transverse joints.

1362 iii. Locate a flat area with the manual straightedge.
1363 A flat area is an area where the entire length of the
1364 bottom of the manual straightedge is in full contact
1365 with the surface of the flat area, there shall be no
1366 gaps for the entire length. The length of the flat
1367 area shall be at a minimum of 20 feet and the width

1368 three times the width of the rolling straight edge or
1369 five feet whichever is greater. Place the rolling
1370 straightedge next to the manual straight edge on
1371 the flat area and read the gauge. The gauge should
1372 read zero on both sides of the gauge.

1373 iv. Place a 3/16-inch shim under the center wheel.
1374 The gauge should read 3/16 inches high on both
1375 sides of the gauge.

1376 v. Remove the 3/16-inch shim and place the
1377 3/8-inch shim under the center wheel. The gauge
1378 should read 3/8 inches high on both sides of the
1379 gauge.

1380 vi. Remove the 3/8-inch shim and place a 3/16-inch
1381 shim under each outside wheel. The gauge should
1382 read 3/16 inches low on both sides of the gauge.

1383 vii. Remove each 3/16-inch shim and place a
1384 3/8-inch shim under each outside wheel. The gauge
1385 should read 3/8 inches low on both sides of the
1386 gauge.

1387 viii. If any of the readings are incorrect, the rolling
1388 straightedge shall be adjusted according to the
1389 manufacturer's specifications and the calibration
1390 rechecked before profile testing begins.

1391 **(14) Procedure**

1392 **(a)** always maintain proper traffic management and safety
1393 precautions as required in the Contract Documents and the
1394 laws of the land. The pavement shall be cleaned just prior to
1395 performing straightedging operations. The rolling straightedge
1396 shall be propelled at a speed of 3 mph or less.

1397 **(b)** During rolling straightedging operations, mark the
1398 pavement at the center wheel where the needle initially shows
1399 a deficiency and where the deficiency ends. A deficiency is
1400 defined according to the specifications. All rolling and manual
1401 straightedging shall be conducted in the wheel path or as
1402 defined in the specifications.

1403 **(c)** At the first transverse joint of the project, place a
1404 12-foot manual straightedge on the new pavement while
1405 overlapping the transverse joint at the beginning of the project

1406 by one inch. Mark the pavement at any location that shows a
1407 deficiency.

1408 **(d)** Locate the back wheel of the rolling straightedge at the
1409 transverse joint at the beginning of the project. If continuing
1410 straightedging operations from a previous stopping point (such
1411 as the end of a day's production), then place the rolling
1412 straightedge at the same location where straightedging was
1413 previously stopped. Pull the rolling straightedge along the
1414 wheel path toward the new pavement to be tested.

1415 **(e)** Stop the front wheel of the rolling straightedge at the
1416 transverse joint at the end of the area being tested. At the
1417 transverse joint at the end of the test area place a 12-foot
1418 manual straightedge on the new pavement while overlapping
1419 the transverse joint at the end of the test area by one inch. Mark
1420 the pavement at any location that shows a deficiency.

1421 **(f)** For bridge approaches, place the rolling straightedge
1422 on the new pavement and start the rolling straightedge at the
1423 same location from the previous straightedging operation. Pull
1424 the rolling straightedge toward the joint until the front wheel
1425 reaches the end of the HMA or concrete pavement layer (see
1426 Figure 1). Mark any deficiencies up to that point, as described
1427 in paragraph **(B)**. Place a 12-foot manual straightedge in the
1428 same location while overlapping the approach slab by one inch
1429 (see Figure 2). Mark the pavement at any location that shows a
1430 deficiency.

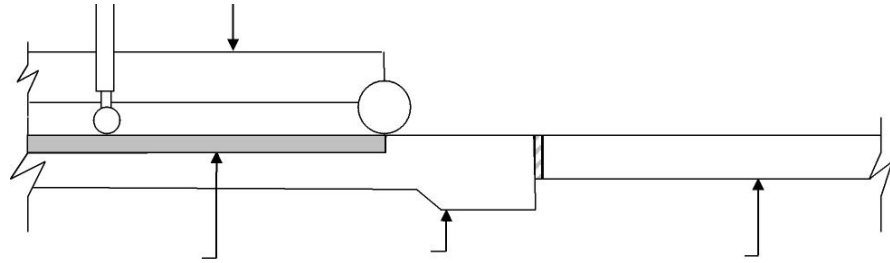
1431 **(g)** For bridge departures, place a 12-foot manual
1432 straightedge at the joint of the bridge departure slab and HMA
1433 or concrete pavement layer, while overlapping the departure
1434 slab by one inch. Mark the pavement at any location that shows
1435 a deficiency. Place the rolling straightedge on the new
1436 pavement with the back wheel at the joint of the bridge
1437 departure slab and HMA or concrete pavement layer. Pull the
1438 rolling straightedge away from the joint toward the new
1439 pavement to be tested. Mark any deficiencies, as described in
1440 paragraph **(B)**.

1441 **(h)** Areas measured with the manual straightedge or
1442 rolling straightedge will not be included in the incentive price
1443 adjustment. These areas shall meet the Contract Document
1444 requirement of not exceeding 1/8 inch in 12-foot length.

1445
1446
1447

Perform remedial work to the pavement surface until it does not exceed 1/8 inch in 12-foot length

12-foot Rolling Straightedge



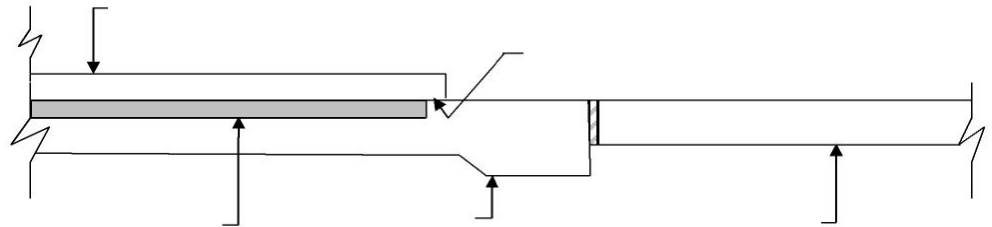
1448
1449
1450
1451
1452

HMA or concrete Layer Approach Slab Bridge Deck

Figure 1 – 12-foot Rolling Straightedge at Approach Slab

1453

12-foot Manual Straightedge 1-inch overlap



1454

1455

HMA or concrete Layer Approach Slab Bridge Deck

1456

Figure 2 – 12-foot Manual Straightedge at Approach Slab

1457

(15) Remedial Work for Pavements

1458

1459

1460

1461

1462

(a) Reduce individual high points over 0.3 inch, as determined by profilograph measurements in accordance with HDOT TM 6, by using remedial repair methods accepted by the Engineer until such high points shown by profilograph reruns do not exceed 0.3 inch.

1463

1464

1465

1466

1467

(b) After completing remedial repairs of high points, perform additional remedial repairs as necessary to reduce the profile index to meet the smoothness requirements of a PI of 7 or equal to or less than 1/8 inch in 12-foot length at areas where required.

1468

1469

1470

(c) Perform additional remedial repairs as necessary so that lateral limits of the remedial repair area are at constant offset from and parallel to nearest lane line or pavement edge.

1471

1472

1473

1474

(d) Perform additional remedial repairs, as necessary, to extend remedial repair area within any one surface area, in each longitudinal direction so that the remedial repair area begins and ends at straight lines normal to pavement centerline.

1475

1476

(e) Remedial repair areas shall be neat, rectangular areas having a uniform surface appearance.

1477

1478

1479

1480

(f) For concrete pavements, unless otherwise indicated in the Contract Documents, grinding shall provide a smooth surface followed by mechanical grooving that gives a line-type texture that contains

1481

1. Grooves shall be 0.10–0.16-inch wide.

1482

2. The land area between the grooves shall be 0.70–0.80-inch wide.

1483

1484 3. Groove depth shall be 0.19 in. deep unless otherwise as
1485 shown on the Contract Documents.

1486 4. The groove tolerances shall be ± 0.02 inch for width and \pm
1487 0.06 inch for depth under normal pavement conditions unless
1488 otherwise directed. a. Tolerances shall not be incorporated into
1489 the initial machine settings but is the amount a dimension can
1490 be allowed to vary in the finished work.

1491 If grinding is used for an HMA pavement the surface shall have
1492 nearly invisible grinding marks to passing motorist.

1493 **(g)** The finished repaired pavement surface shall leave no
1494 ridges or valleys or fins of pavement other than those allowed
1495 below.

1496 **(h)** Remedial repairs shall not leave any drainage
1497 structures' inlets higher than the surrounding pavement or alter
1498 the Contract Document's drainage pattern.

1499 **(i)** For items in the pavement other than drainage
1500 structures, e.g., manhole frame and covers, survey
1501 monuments, expansion joints etc., the finish pavement, ground
1502 or not, shall not be more than 1/8 inch in elevation difference.
1503 Submit to the Engineer remedial repair method to correct these
1504 conditions for acceptance.

1505 **(j)** Do not grind pavement to smooth or polished final
1506 finish, i.e., do not decrease the friction coefficient of the finished
1507 pavement.

1508 1. When the Engineer determines that the ground
1509 pavement surface is smooth or has a polished finish; i.e.,
1510 has the appearance to the Engineer that the roadway
1511 surface's coefficient of friction has decreased, submit
1512 remedial repair method to correct the condition.

1513 **(k)** Pick up immediately grinding operation residue by
1514 using a vacuum attached to grinding machine or other method
1515 acceptable to the Engineer.

1516 1. Any remaining residue shall be picked up before
1517 the end of shift or before the area is open to traffic,
1518 whichever is earlier.

1519 2. Prevent residue from flowing across pavement or from
1520 it being left on pavement surface or both.

- 1521 3. Residue shall not be allowed to enter the drainage
1522 system.
- 1523 4. The residue shall not be allowed to dry or remain on
1524 the pavement.
- 1525 5. The collection effectiveness of the method being
1526 used to pick up slurry residue shall be at a level that when
1527 vehicles drive across the ground surface there is no visible
1528 tracking of residue or dust. No dust shall be “kicked up”
1529 by passing vehicles.
- 1530 6. Dispose of all material that is the result of the
1531 remedial repair operation, e.g., concrete or HMA residue,
1532 wastewater, dust.
- 1533 **(l)** For concrete pavement
- 1534 1. Profile grinding to obtain surface smoothness is
1535 not a substitute for diamond grinding grooves for texture
1536 or artificial turf drag and tining.
- 1537 2. Diamond grinding grooves into the concrete
1538 surface for texture shall be performed separately and, in a
1539 pattern, acceptable to the Engineer.
- 1540 3. No curing compound shall be sprayed on top of the
1541 residue.
- 1542 i. Curing compound shall be applied at the
1543 required rate on top of the ground surface
1544 immediately after grinding is complete and residue
1545 is picked up unless the pavement is 28 days or
1546 older.
- 1547 **(m)** Use of bush hammers and other impact devices shall
1548 not be used for pavement surface remediation.
- 1549 **(n)** Complete corrective work before determining
1550 pavement thickness for portland concrete pavements with
1551 Subsection 411.03(T) - Pavement Thickness.
- 1552 **(o) Curing.** After finishing operations have been completed and as soon
1553 as marring of concrete will not occur, cure entire newly placed concrete
1554 surface and edges in accordance with one of the methods described in this
1555 subsection. When curing requires use of water, assign highest priority for
1556 project water supply allocation to curing operations. Suspend concrete
1557 operations if there is insufficient cover material or water supply for curing and

1558 other project requirements. Do not leave concrete exposed for more than 30
1559 minutes between finishing stage and the start of curing or during curing
1560 period. Use atomized fog spray to place water into the air to increase the
1561 humidity as an interim cure or other methods accepted by the Engineer until
1562 final curing medium is in place. Cure concrete for at least 72 hours
1563 immediately after finishing operation unless otherwise directed by the
1564 Engineer or Contract Documents or both. When water is used for curing, the
1565 water shall not change the water/cement ratio of any portion of the concrete
1566 or mar the concrete. Do not let curing water enter the drainage system or
1567 waterways. Submit collection of curing water part of the project pollution
1568 prevention BMP.

1569 **(1) Cotton or Burlap Mats.** Cover surfaces to be cured with
1570 cotton or burlap mats having dimensions that when placed, extend at
1571 least 2 feet beyond edges of concrete strip placed. Overlap mats at
1572 least 6 inches. Place and maintain mats in complete contact with
1573 surface being cured, throughout curing period. Keep mats fully moist
1574 and in position for entire portion of required cotton or burlap curing
1575 period. Dried mats may be cause of rejection of the affected concrete.
1576 Address any run-off water as part of the project pollution prevention
1577 BMP.

1578 **(2) Waterproof Paper.** Thoroughly wet pavement surface and
1579 edges before placing paper. Cover surfaces to be cured with waterproof
1580 paper, sized to extend when sheets are placed, at least 2 feet beyond
1581 edges of concrete strip; or sized to match pavement width and
1582 supplemented with 2-foot paper edge strips. Overlap sheets at least 18
1583 inches. Place and maintain paper in complete contact with surface
1584 being cured, throughout curing period. When sheets are laid
1585 longitudinally, seal paper so that it does not open or separate during
1586 curing period. Do not allow the wind to blow the sheeting off the concrete
1587 surface.

1588 **(3) White-Pigmented Curing Compound.** Immediately after
1589 finishing surface and before concrete set has taken place, spray
1590 uniformly surfaces to be cured with white-pigmented curing compound.
1591 When cotton or burlap mats are used to initially cure pavement, apply
1592 white-pigmented curing compound immediately upon removal of mats.
1593 Do not apply curing compound during and immediately after rainfall.

1594 (a) Use fully atomized mechanical sprayer equipped with
1595 tank agitator and wind guard to apply curing compound using
1596 two coats of 150 square feet per gallon per coat to avoid rapid
1597 loss of moisture from the concrete. The maximum time elapsing

1598 between coats of curing compound shall be no greater than 30
1599 minutes. Failure to apply the second coat of curing compound
1600 is a cause for rejection of the deficient area. Application shall
1601 be in two different directions to minimize holidays in the curing
1602 compound. If surface runoff of the curing compound occurs,
1603 apply the curing compound in more than two separate coats.
1604 Before spaying, the compound shall be in thoroughly mixed
1605 condition with pigment uniformly dispersed throughout the
1606 curing compound tank. Mechanically agitate compound
1607 continuously during application. Hand-pump sprayers will be
1608 allowed only for spraying irregular widths and shapes and
1609 concrete surfaces exposed by form removal. Do not apply
1610 curing compound to inside faces of joints to be sealed.

1611 1. The surface that had the white-pigmented curing
1612 compound applied to after it dries and throughout the
1613 curing period shall have the appearance of having been
1614 painted with white paint and shall have no holidays, no
1615 gray or concrete showing through. If the curing compound
1616 fails to prevent the gray or concrete from showing through
1617 immediately apply another coat of curing compound and
1618 modify application method to prevent the gray or concrete
1619 from showing though. If surface is not white in color,
1620 immediately reapply and keep reapplying curing
1621 compound until surface is white and remains white for the
1622 entire curing period. Provide means to verify application
1623 rate of curing compound.

1624 2. If curing film is damaged during required curing period,
1625 immediately repair damaged portions with additional
1626 curing compound. Upon removal of side forms,
1627 immediately protect exposed slab edges with curing
1628 treatment equivalent to that provided for pavement
1629 surface. After saw cutting the joints and the removal of all
1630 concrete residues apply curing compound to the joint to
1631 seal the newly sawed concrete surface.

1632 3. Before concrete is poured against a surface that has
1633 curing treatment applied to it the curing treatment shall be
1634 completely removed. Care shall be taken during the
1635 removal of the curing compound not to disturb the
1636 aggregate material under the concrete slab or undermine
1637 the slab. When a curing compound used on the edges,

1638 that has been accepted by the Engineer, does not create
1639 a bond breaker between previously poured and freshly
1640 poured concrete removal of the curing compound may be
1641 waived by the Engineer.

1642 **(4) White Polyethylene Sheeting.** Cover surfaces to be cured
1643 with polyethylene sheeting, sized to extend when sheets are placed, at
1644 least 2 feet beyond edges of concrete strip. Overlap sheets at least 18
1645 inches. Place and maintain sheeting in complete contact with surface
1646 covered, throughout curing period. Do not allow the wind to blow the
1647 sheeting off the concrete surface.

1648 **(P) Removing Forms.** Keep forms in place for at least 12 hours.
1649 Protect pavement from damage during form removal. After removing forms,
1650 immediately cure exposed surfaces in accordance with Subsection
1651 411.03(O) - Curing. Pavement areas containing major honeycombed areas
1652 will be rejected. Remove and replace rejected pavement areas that are full-
1653 lane-wide sections and at least 10 feet long. In, areas where removal and
1654 replacement are necessary, the remaining portions of slab shall not be less
1655 than 10 feet long to the adjacent transverse joints. Additional dowels and
1656 tie bars shall be provided and installed as directed by the Engineer.

1657 **(Q) Sealing Joints.** When sealing of joints are required by the Contract
1658 Documents the following shall be done:

1659 **(1)** Clean and seal joints after completion of curing period and
1660 before pavement is opened to traffic.

1661 **(a)** Clean each joint thoroughly of foreign matter, including
1662 debris, dirt, dust, concrete, saw cuttings, oil, and curing
1663 material. Collect and dispose of all removed material.

1664 **(b)** Dry joint surfaces before sealing joint. If compressed
1665 air is used the air shall be oil free.

1666 **(c)** Apply sealing material as indicated in the Contract
1667 Documents.

1668 1. If hot sealer is used, stir material during heating to
1669 prevent localized overheating.

1670 **(d)** Pour or caulk sealing material without spilling or
1671 extruding on exposed concrete pavement surfaces.
1672 Immediately remove and clean excess material from pavement
1673 surface. Use of sand or similar material as a cover for sealing
1674 material will not be allowed.

1675 (e) The top of the sealant shall be as indicated in the
1676 Contract Documents.

1677 **(R) Protection of Pavement.** Protect pavement and its appurtenances
1678 from public and construction traffic. Protection shall include using flaggers
1679 to direct traffic; and erecting and maintaining warning signs, lights,
1680 pavement bridges, and crossovers.

1681 Where indicated in the contract documents, construct pavement crossings
1682 for convenience of public traffic in accordance with Subsection
1683 104.09 - Maintenance of Traffic.

1684 Furnish and install materials for edge and surface protection of unhardened
1685 concrete. Edge protection materials include standard metal forms and
1686 wood planks having nominal thickness of not less than 2 inches and nominal
1687 width of not less than pavement-edge thickness. Surface protection
1688 materials include burlap or cotton mats, curing paper, and plastic sheeting.
1689 Stop paving operations when rain appears imminent and protect concrete
1690 already poured.

1691 Repair or replace damaged pavement before final acceptance. New
1692 pavement that are broken, have spalled edges shall be removed and
1693 replaced or repaired.

1694 No partial removal of a slab as a remedial repair method shall be used. The
1695 entire slab shall be removed, i.e., remove a slab from transverse joint to
1696 transverse joint and longitudinal joint to longitudinal joint.

1697 **(S) Opening to Traffic.** Allow traffic on pavement when test specimens
1698 complying to Subsection 411.03(J) - Test Specimens have attained flexural
1699 strength of 550 pounds per square inch when tested in accordance with
1700 AASHTO T 97. Traffic will not be allowed on pavement sooner than seven
1701 days after concrete placement, regardless of strength attainment.

1702 Clean, install signs, mark pavement properly, install all safety devices and
1703 clear pavement of obstructions before opening roadway to public traffic. All
1704 pavement marking and striping including temporary ones shall meet all
1705 dimensions shown in the MUTCD and Contract Documents. Remove all
1706 curing compound from surface of pavement before placement of any
1707 pavement marking and striping is applied to that surface.

1708 Construction traffic, equipment, and materials will not be allowed on
1709 pavement during the curing period and before the time designated and
1710 accepted in the paving plan. Dowel drilling machines may be used on the
1711 pavement during the curing period when accepted by the Engineer. Dowel
1712 drilling machines shall be placed far enough from the edge of the pave so it

1713 will not damage the pavement. Make its use and procedure part of the
1714 paving plan when accepted by the Engineer.

1715 Should the Contractor open the pavement to traffic before all testing is
1716 complete, e.g., pavement thickness the Contractor shall provide traffic
1717 control for the preparation of all the test locations, all testing being
1718 performed, and any additional work require related to the testing, e.g.,
1719 barriers, barricades, at no additional cost. At no additional cost provided
1720 labor, material and equipment to layout, and prepare the area to be tested;
1721 as directed by the Engineer. Flexural strength testing shall be completed
1722 and meet required time and strength requirements before opening
1723 pavement to traffic.

1724 **(T) Pavement Thickness.** The Engineer will determine coring
1725 locations. The coring operation will be witnessed by the Engineer who
1726 identifies, marks, and takes immediate custody of the cores. Cores are not
1727 taken within 2 feet of the edge of pavement, over dowels, or within 5 feet of
1728 a transverse construction joint. The core's sample diameter shall be a
1729 minimum of six inches.

1730 The Engineer will check thickness of pavement by cores obtained by the
1731 Contractor in accordance with AASHTO T 24. The Engineer will measure
1732 cores in accordance with AASHTO T 148, except that measurement will be
1733 taken to nearest one thousandth of an inch; and average of such
1734 measurements will be taken to nearest one hundredth of an inch. Take
1735 thickness core samples after completion of corrective work.

1736 The Engineer will remove non-PCC pavement materials, e.g., base course,
1737 geotextile, from bottom of core before determining pavement thickness.

1738 Thickness core samples will be evaluated on basis of pavement units. A
1739 pavement unit is defined as that area of pavement placed in each day's
1740 paving operations at a single location. If a day's paving exceeds 1,000
1741 linear-feet of lane an additional core shall be taken for each additional 1,000
1742 linear-feet of lane or fraction thereof. Each ramp, including tapers,
1743 intersection, and crossover will be considered separate pavement unit if
1744 they are paved in a day and consist of one lane. If the ramp, including
1745 tapers, intersection, and crossover does not meet the previous criteria use
1746 the pavement unit definition, e.g., each day's paving, 1,000 linear-feet of
1747 lane to determine the number of pavement units. Drill one core for each
1748 pavement unit. The Engineer will determine the location of all cores, it may
1749 also reduce the number of cores if small fractional areas would be
1750 accurately represented by an adjacent pavement unit.

1751 A pavement unit is also defined as 1,000 linear feet, or fraction thereof, of

1752 a shoulder or median area. Shoulders less than four feet and shoulders
1753 paved monolithically with an adjacent lane will be regarded as part of that
1754 pavement unit.

1755 When the pavement unit core is deficient by more than 0.2 inch but less
1756 than 0.6 inch, drill two additional cores within same pavement unit. Length
1757 of initial and two additional cores will be averaged.

1758 Cores that exceed the Contract Document's required thickness will, in
1759 calculations, be considered at the Contract Document's required thickness.

1760 When the pavement unit core is deficient by more than 0.6 inch, that core
1761 will not be used to determine average thickness of the pavement unit. It will
1762 be regarded as an indication of pavement not meeting contract
1763 requirements. Drill additional cores at intervals not exceeding 10 feet in
1764 both up and down station directions from deficient core. These additional
1765 cores are obtained on a line which passes through the original core and
1766 parallel to the centerline of the pavement. The drilling continues in both
1767 directions at approximately 10-foot intervals until two successive cores
1768 indicate a thickness deficiency of 0.6 in. or less, or where cores may no
1769 longer be obtained in the new PCC. pavement thickness between these
1770 final two additional cores will be evaluated separately from balance of
1771 pavement in that pavement unit.

1772 Pavement limits for separate evaluation will be longitudinal weakened plane
1773 or construction joint on each side of core and the next transverse weakened
1774 plane, construction, or expansion joint, beyond each of last two cores.
1775 Unless the Engineer allows pavement within evaluation limits to remain,
1776 remove and replace with pavement of specified thickness, at no increase in
1777 contract price or contract time. Drill one additional core in remaining portion
1778 of the primary or secondary unit. That portion will be evaluated separately
1779 for payment in accordance with provisions specified in Subsection 411.05 -
1780 Payment. Use this method to determine the limits of removal not only for
1781 thickness defects but for other defects as well.

1782 When a single core indicates a thickness deficiency of more than 1.0 in., or
1783 if two or more adjacent cores indicate a non-compliant thickness deficiency
1784 of more than 0.6 in., the investigation will be expanded to include adjoining
1785 PCC pavement lane or lanes. Additional cores will be taken from the
1786 adjoining traffic lanes or shoulders at the same station at which the first core
1787 and at cores that indicated the non-compliant thickness deficiency, whether
1788 the lane was paved at the same time or not.

1789 After replacing the non-compliant deficient pavement, drill one core at
1790 random in the pavement unit the replaced pavement to verify that it is

1791 complying with the Contract Documents.

1792 Before filling core holes, roughen the walls of the core holes to a minimum
1793 concrete surface profile (CSP) of CSP-4 or higher, clean hole of dust,
1794 debris, grease, oil, dirt, curing compounds, release agents, or any other
1795 surface or penetrated contaminants that will adversely affect the bond.
1796 Sanding, wire brushing, or grinding are not approved surface preparation
1797 methods. Then apply, in accordance with recommendations by the epoxy
1798 grout manufacturer to the core hole wall, an epoxy grout complying to
1799 Subsection 712.04(B) -- Epoxy Grout. Fill cored holes completely with
1800 non-shrink, non-metallic grout, complying to Subsection 712.04(A) --
1801 Non-shrink Grout with a minimum compressive strength equal to or greater
1802 than the design strength of the pavement concrete surrounding it. Grout
1803 shall match the color of the pavement concrete surrounding it. Submit
1804 non-shrink grout technical details to the Engineer for review and
1805 acceptance. Do not use grout until it is accepted. Add 0.25 lbs/cu ft of 0.75
1806 to 1.0 inch-long macro structural fibers to the non-shrink grout during
1807 mixing. The macro structural fibers shall be compatible with the non-shrink
1808 grout. Ensure that structural fibers are evenly distributed throughout the
1809 grout mix before pouring into cored hole. Fill cored hole with the non-shrink
1810 grout within the time period recommended by the epoxy grout manufacturer
1811 before its bond strength decreases. The grout shall be consolidated with a
1812 pencil stinger; and the surface finished textured to match the surrounding
1813 concrete and a curing compound applied. If the concrete in the core hole
1814 is higher than the surrounding concrete grind it until level with the
1815 surrounding pavement. Regroove surface of core hole.

1816 **(U) Cracks and Other Defects in Pavement.** The Engineer will inspect
1817 for cracks and other defects in the placed concrete pavement after a
1818 minimum of 60 days has passed since the day of installation. The
1819 Contractor shall lightly wet the concrete surface and let the surface dry so
1820 that cracks in the pavement become visible. Repeat as often as required
1821 by the Engineer. Other defects in the pavement may be located by using
1822 means determined by the Engineer. Provide traffic control during the
1823 inspection as well as cleaning the pavement. All cracks and defects in the
1824 pavement shall be repaired using a method acceptable to the Engineer or
1825 if directed by the Engineer the pavement is to be removed and replaced.

1826 New pavement that contain cracks shall be removed and replaced or
1827 repaired. Pavement with cracks that do not exceed 25 percent of the design
1828 thickness in depth and are 0.006-inch in width shall be cleaned and then
1829 pressure injected full depth with ASTM C881 epoxy resin, Type IV, Grade

1830 1. Slabs containing cracks deeper than 25 percent of the design thickness
1831 no matter what the width shall be removed.

1832

1833 **(V) Certified Concrete Flatwork Finisher Requirement.** Perform the
1834 placement and finishing operations of concrete flatwork with a minimum
1835 ratio of two workers who are both certified as an ACI Concrete Flatwork
1836 Finisher and ACI Concrete Flatwork Technician with 4,500 hours of
1837 acceptable work experience (certified craftsman) per four concrete finishers
1838 (concrete finishers without ACI Concrete Flatwork Finisher and Technician
1839 certification and 4,500 hours of acceptable work experience) at each
1840 location on the project site having flatwork done. The concrete flatwork shall
1841 be under the direct supervision of a certified craftsman. Designate the
1842 certified craftsman who will be supervising and responsible for determining
1843 the quality of the finish of the concrete flatwork being performed. No flatwork
1844 shall be performed without the required amount of certified craftsman
1845 present.

1846 **(1)** Flatwork concrete is defined as any concrete work that
1847 requires tools or machines to be used during the placement and
1848 finishing operations of concrete. Concrete flatwork includes concrete
1849 work that requires a specified finishing, smoothness or rigid surface
1850 tolerances such as sidewalks, walkways, portland cement concrete
1851 pavement, concrete white-topping, girder seats, pier caps, bridge
1852 decks, on-grade concrete slabs, approach slabs, concrete overlays,
1853 and concrete repairs which exceed one square foot per day.

1854 **(2)** Areas that are not considered flatwork concrete are the top of
1855 foundations or structures that will have backfill material placed
1856 directly on the concrete surface.

1857 **(3)** Submit copies of the craftsman's current ACI certification 30
1858 days before concrete flatwork begins for the Engineer's review and
1859 acceptance. The Engineer has the right to require the removal,
1860 replacement, retraining and re-certification of a certified craftsman if
1861 that person does not, in the opinion of the Engineer, demonstrate the
1862 ability to place and finish concrete in accordance with the practices
1863 recommended in the ACI Concrete Flatwork Finisher Certification
1864 Program and to meet the finishing standards required by the contract
1865 documents.

1866 **(4)** Any cost or impact to the contractor in providing, training,
1867 certification, retraining, replacement or re-certification is incidental to
1868 the contract items that require concrete flatwork.

1869
1870
1871
1872
1873
1874
1875
1876
1877
1878
1879
1880
1881
1882
1883
1884
1885
1886
1887
1888
1889
1890
1891
1892
1893
1894
1895
1896
1897
1898
1899
1900
1901
1902
1903
1904

411.04 Measurement.

(A) The Engineer will measure Concrete Pavement per cubic yard in accordance with the Contract Documents.

(B) Engineer will not pay for joints separately. The Engineer will consider the cost for all joint work as included in the contract price of the concrete pavement.

411.05 Payment. The Engineer will pay for the accepted pay items listed below at the contract price per pay unit, as shown in the proposal schedule. Payment will be full compensation for all the work prescribed in this section and the contract documents.

An accepted test strip that will remain in place will be considered as a concrete pavement placement and will be paid under that and other appropriate contract items. Test strips that are found unacceptable will not be paid for.

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

Pay Item	Pay Unit
_____ -Inch Concrete Pavement	Cubic Yard

For unit price the Engineer will pay for:

(A) 70 percent of the contract bid price upon completion of furnishing and placing concrete pavement, formed joints or cutting grooves in pavement, texturing, curing, required submittals and reports are accepted by the Engineer

(B) 10 percent when contractor submits reports, road profile showing results compliant with the requirements of the Contract Documents.

(C) 20 percent of the contract bid price upon completion of cleaning up, including removal of saw-cutting, grinding residue and compliant results are obtained for the pavement thickness.

When the thickness of a pavement unit's core is deficient by not more than 0.2 inch from planned thickness, the Engineer will pay for that primary or secondary unit at 100 percent.

When the average pavement unit's core thickness indicates pavement thickness is deficient by more than 0.2 inch but not more than 0.6 inch, the Engineer will determine the adjusted payment for that pavement unit that will be the final adjusted price after adjustments have been made for other

1905
1906
1907

deficiencies, if any are applicable. The acceptability and pay factors for deficient thickness areas using Table 1.

Table 1

Price Reductions for Deficient Thickness	
Deficient Thickness (inches)	Pay Factor
0.0 to 0.2	1.00
More than 0.2 to 0.25	0.90
More than 0.25 to 0.5	0.80
More than 0.5 to 0.6	0.60
More than 0.6	Reject

1908

1909
1910
1911

The Engineer will not pay for pavement or allowed it to remain that has a thickness deficiency greater than 0.6 inch. Remove immediately all such pavement in a timely manner and on a schedule directed by the Engineer.

1912
1913
1914
1915
1916

When the Engineer determines that thickness-deficient areas warrant removal, remove and replace those areas with concrete having thickness indicated in the contract documents. Replacement pavement will be in accordance with requirements of Subsection 411.03(T) - Pavement Thickness and this subsection.

1917
1918
1919
1920
1921
1922
1923
1924
1925

When the pavement profile index does not exceed 7.0, or IRI equivalent the Engineer will pay for the accepted pavement. When pavement profile index exceeds 7.0, or IRI equivalent the pavement surface profile requires remedial repairs, i.e., corrective work to lower the profile index to 7.0 or less before acceptance and payment will be made. The Contractor may, on its own volition choose to remove the non-compliant area and replace it with pavement that meets the contract requirements. The Contractor shall not leave any pavement in place that has a profile index greater than 7.0, or IRI equivalent.

1926
1927

The Engineer at its sole digression may subtract from the monthly payment the amount previously paid for work that is found non-compliant.

1928

No payment will be made for non-compliant work.

1929
1930

The Engineer will not pay for longitudinal joints, transverse expansion joints, transverse contraction joints, or construction joints separately and will

1931 consider the cost for those items as included in the contract price for the
1932 concrete pavement pay item. The cost is for the work prescribed in this
1933 section, Section 411 — Portland Cement Concrete Pavement, and the
1934 contract documents."

1935

1936

1937

END OF SECTION 411"

SECTION 503 - CONCRETE STRUCTURES

1
2
3 Make the following amendments to said Section:
4

5 **(I)** Amend **503.01 Description** by revising the word culverts in line 4 to read
6 “box culverts”.
7

8 **(II)** Amend **503.02 Materials** by deleting Abrasive Coating 712.11 at line 31
9 and by adding the following after line 32:

10
11 “Grout 712.04”
12

13 **(III)** Amend **503.03(B) Falsework, Formwork, or Centering** as follows:
14

15 Delete the word formwork from line 59.
16

17 Replace the words “AASHTO LRFD Bridge Specifications” with “AASHTO Guide
18 Design Specifications for Bridge Temporary Works” at line 78.
19

20 Add the following two sentences at the end of the first paragraph at line 63:
21 “Formwork is a temporary structure or mold used to retain the plastic on fluid
22 concrete in its designated shape until it hardens. Formwork must have enough
23 strength to resist the fluid pressure exerted by plastic concrete and any additional
24 fluid pressure effects generated by vibrations.”
25

26 **(IV)** Amend **503.03(B) Falsework, Formwork, or Centering** by adding the
27 following sentence to the seventh paragraph at line 106:
28

29 “Temporary bracing shall be provided, as necessary to withstand all imposed
30 loads during erection, construction and removal of falsework.”
31

32 **(V)** Amend **503.03(B) Falsework, Formwork, or Centering** by revising the
33 ninth paragraph from lines 112 to 122 as follows:
34

35 “Show stresses and deflection of load supporting members in design
36 calculations. Show anticipated total settlements of falsework and forms on
37 falsework drawings, including falsework footing pressure and settlement, and
38 joint take-up. Construct deck slab form between girders with no allowance for
39 settlement relative to girders. Do not exceed 1 inch for anticipated settlements of
40 falsework. Provide tell-tales attached to soffit forms, readable from the ground,
41 at sufficient locations to determine total settlements and deflections resulting
42 form concrete placement. Check for any movement or deformation of forms and
43 falsework that may exceed the calculated or anticipated deflection or settlement.
44 If the movement or deformation is exceeded, take appropriate action. This action
45 may include halting concrete placement to install additional bracing or changing
46 the rate or sequence of concrete placement to achieve the required lines and

47 grade. Discontinue concrete placement when settlements deviate more than ±
48 3/8 inch from those indicated on falsework drawings. In such affected areas,
49 provide corrective measures prior to initial set of concrete. Remove
50 unacceptable concrete.”

51

52 **(VI)** Amend **503.03(C)(1) Construction** by revising the first paragraph
53 between lines 169 and 172 as follows:

54

55 **(1) Construction.** “Use wood or metal forms that are impervious to
56 moisture, non-staining to concrete, mortar tight and sufficiently rigid to prevent
57 distortion due to pressure of concrete and other loads, including vibration,
58 incidental to construction. Construct and maintain forms to prevent joints from
59 opening. Formwork joints shall be filled with approved material that is impervious
60 to moisture, will not stain concrete, and produces tight joints.”

61

62 **(VII)** Amend **503.03(C)(1) Construction** by revising the second paragraph
63 between lines 174 and 176 to read as follows:

64

65 “Unless otherwise indicated in the contract documents, place minimum 3/4
66 inch by 3/4 inch chamfer at sharp edges of exposed concrete surfaces. Give
67 girder and coping forms bevels or drafts to ensure easy removal.”

68

69 **(VIII)** Amend **503.03(C)(1) Construction** by adding the following sentence to
70 the ninth paragraph at line 209:

71

72 “The Engineer will stop the use of the forms or forming systems which
73 produce a concrete surface with excessive undulations until the Contractor
74 makes modification acceptable to the Engineer.”

75

76 **(IX)** Amend **503.03(C)(2) Form Lumber** by adding the following sentence to
77 the first paragraph after line 223:

78

79 “When requested by the Engineer, submit certificates verifying grade and
80 species of any piece of lumber which does not have a grade or species stamp.”

81

82 **(X)** Amend **503.03(D) Removal of Falsework and Forms** by revising Table
83 503.03-1 – Removal of Falsework and Forms at line 297 to read as follows:

84

85

86

87

88

89

90

91

92

“TABLE 503.03-1 – REMOVAL OF FALSEWORK AND FORMS						
Railing and Barriers – 12 Hours Removal Time						
Beams, Arches, and Other Members – 14 days Removal Time						
Slabs With Maximum Thickness of (Inches)	9		12		More Than 12	
Removal Time (Days)	7		10		14	
Walls, Columns, and Vertical Sides of Beams With Maximum Height of (Feet)	2	5	10	20	30	40 or More
Removal Time (Days)	0.5	1	2	3	5	7
Note: Where forms also support vertical or horizontal loads imposed on slab or beam soffits, use 14 days for removal time.”						

94

95 **(XI) Amend 503.03(D) Removal of Falsework and Forms** by deleting the
96 last paragraph between lines 329 and 334.

97

98 **(XII) Amend 503.03(E) Loading** by deleting the words, “except abutment walls
99 and wing walls” in line 337.

100

101 **(XIII) Amend 503.03(F)(1) General** by adding the following paragraphs after
102 line 419:

103

104 “At the time of placement, the concrete temperature shall not exceed 90
105 degrees Fahrenheit.

106

107 The rate of evaporation shall be measured by using the nomograph: ACI
108 308R Figure 4.1 Nomograph for Estimating the Maximum Potential Rate of
109 Evaporation of the Environment Assuming a Water-Covered Surface in Which
110 the Water Temperature Is Equal to the Concrete Temperature or by using an
111 evaporation rate calculator e.g., Kestrel 5200 hat has been reviewed and
112 accepted by the Engineer. Use procedures as stated in ACI 308R Chapter 4 –
113 Monitoring Curing and Curing Effectiveness. Approximately 30 minutes prior to
114 the scheduled start of concrete placement measure the ambient air temperature,
115 relative humidity and wind velocity with industrial grade weather monitoring
116 instruments or with an evaporation rate calculator to determine the on-site
117 evaporation rate. When the rate of evaporation is equal to or exceeds 0.05 lb/sq

118 ft/h fogging shall begin. During the placement of the concrete recalculate
119 evaporation rate every 15 minutes using new real-time data including actual
120 temperature of concrete being placed. The concrete shall be fogged before,
121 during and after finishing. Fogging shall start at the point the bleed water starts to
122 evaporate. Fogging may stop when the curing compound application is complete.
123 Fogging shall be accomplished by self-powered atomized mister, e.g. BossTek
124 DustBoss, that creates a mist of water droplets above the concrete surface that
125 will float in the air. The droplets should float in the air, not fall on the concrete.
126 The goal is to humidify the air, not wet the concrete. Let the water evaporate
127 before finishing. If the concrete is fogger before floating, brooming or trowelling,
128 do not finish the accumulated surface water into the concrete surface or it will
129 weaken it. Do not allow water to run off the concrete surface. Adjust foggers or
130 pause its operation. Foggers shall not drip water on the poured concrete surface.
131 Point foggers into the air above the concrete pour not at it and not in the direction
132 of the incoming wind. It shall not be acceptable to use a water hose to spray
133 water into the air as a substitute. This will be considered adding additional water
134 to the deck surface. If plastic shrinkage cracks appear during the finishing, the
135 cracks shall be closed by striking each side of the crack with a float and
136 refinishing the concrete.”

137

138 **(XIV) Amend 503.03(F)(2) Box Culverts** by revising the paragraphs from lines
139 421 to 429 as follows:

140

141 **(2) Box Culverts.** “Place and allow base slab or footings of box culverts
142 to set at least 12 hours before constructing remainder of culvert.

143

144 When constructing box culverts, place and allow concrete in walls to set at
145 least 12 hours before placing top slab. Provide appropriate keys in
146 sidewalls for anchoring top slab.”

147

148 **(XV) Amend 503.03(F)(3) Box Girder Spans** by revising the title Box Girder
149 Spans at line 431 to read Sequence.

150

151 **(XVI) Amend 503.03(F)(7) Hot Weather Concreting** by adding the word
152 “ambient” in front of the word “temperature” at line 560.

153

154 **(XVII) Amend 503.03(F) Placing Concrete** by adding the following Subsection
155 after line 565:

156

157 **“(8) Certified Concrete Flatwork Finisher Requirement.** Perform
158 the placement, and finishing operations of concrete flatwork with a
159 minimum ratio of one certified ACI Concrete Flatwork Finisher and
160 Technician with 4,500 hours of acceptable work experience (certified
161 craftsman) per three concrete finishers (concrete finishers without ACI
162 Concrete Flatwork Finisher and Technician certification and 4,500 hours of
163 acceptable work experience) at each location having flatwork done. The

164 concrete flatwork shall be under the direct supervision of a certified
165 craftsman. Designate the certified craftsman who will be supervising and
166 responsible for determining the quality of the finish of the concrete flatwork
167 being performed. No flatwork shall be performed without the required
168 amount of certified craftsman present.

169
170 (a) Flatwork concrete is defined as any concrete work that
171 requires tools or machines to be used during the placement and
172 finishing operations of concrete. Concrete flatwork includes
173 concrete work that requires a specified finishing, smoothness or
174 rigid surface tolerances such as sidewalks, walkways, Portland
175 cement concrete pavement, concrete white-topping, girder seats,
176 pier caps, bridge decks, on-grade concrete slabs, approach slabs,
177 concrete overlays, and concrete repairs which exceed one square
178 foot per day.

179
180 (b) Areas that are not considered flatwork concrete are the top
181 of foundations or structures that will have backfill material placed
182 directly on the concrete surface.

183
184 (c) Submit copies of the craftsman's current ACI certification 30
185 days before concrete flatwork begins for the Engineer's review and
186 acceptance. The Engineer has the right to require the removal,
187 replacement, retraining and re-certification of a certified craftsman if
188 that person does not, in the opinion of the Engineer, demonstrate
189 the ability to place and finish concrete in accordance with the
190 practices recommended in the ACI Concrete Flatwork Finisher
191 Certification Program and to meet the finishing standards required
192 by the contract documents.

193
194 (d) Any cost or impact to the contractor in providing, training,
195 certification, retraining, replacement or re-certification is incidental
196 to the contract items that require concrete flatwork."

197
198 (XVIII) Amend **503.03(G) Joints** by adding the following sentence after line 566:
199

200 "Prior to backfilling with earth or other materials against the joints, all
201 construction, expansion, contraction, and control joints shall be waterproofed with
202 flashing compound waterproofing as detailed in the Standard Plans."
203

204 (XIX) Amend **503.03(G)(1) Construction Joints** by revising the second
205 paragraph between lines 572 and 579 to read as follows:
206

207 "Before placing concrete on substrate concrete at construction joint, the
208 following work shall be performed:
209

210 (a) Remove laitance, loose particles, dust, dirt, impervious
211 membrane curing compound, and any other material foreign to the
212 construction joint and projecting reinforcement.

213
214 (b) Roughen horizontal construction joint by abrasive blast
215 cleaning or other approved methods to full amplitude of
216 approximately ¼ inch.”

217
218 (XX) Amend **503.03(G)(3) Contraction Joints** by revising the first paragraph
219 from lines 661 to 665 to read as follows:

220
221 “(3) **Contraction Joints.** Contraction joints in walls and in other
222 structures shall be spaced at not more than 20 feet on centers and shall
223 be spaced, at abrupt changes in height or thickness and at obtuse corners
224 unless otherwise directed by the Engineer.”

225
226 (XXI) Amend **503.03(I)(3) Flashing Compound for Joints** between lines 755
227 and 757 by deleting this subsection.

228
229 (XXII) Amend **503.03(L) Curing Methods** by adding the following paragraph
230 after line 794:

231
232 “The Contractor shall have the option to use curing compound SINAK WCE or
233 SINAK LITHIUM for bridge structures when approved by the Engineer. Six
234 copies of the manufacturer’s brochure and certificates of test results shall be
235 submitted. All work shall conform with the manufacturer’s recommendations.”

236
237 (XXIII) Amend **503.03(L)(2) Impervious Membrane Curing** by revising the third
238 sentence of the first paragraph from lines 818 to 819, to read as follows:

239
240 “Use ratio of at least one gallon for each 100 square feet of concrete
241 surface.”

242
243 (XXIV) Amend **503.03(L)(2) Impervious Membrane Curing** by adding the
244 following sentences to the first paragraph after line 819:

245
246 “The curing compound shall be applied to the concrete following the surface
247 finishing operation, immediately before the moisture sheen disappears from the
248 surface, but before any drying shrinkage or craze cracks begin to appear. In the
249 event of any drying or cracking of the surface, application of water with an
250 atomizing nozzle (fog spray) as specified in Section 503.03(L)(1), “Water Curing”,
251 shall be started immediately and shall be continued until application of the
252 compound is resumed or started; however, the compound shall not be applied
253 over any resulting freestanding water. Should the film of compound be damaged
254 from any cause before the expiration of 7 days after the concrete is placed in the

255 case of structures and 72 hours in the case of pavement, the damaged portion
256 shall be repaired immediately with additional compound.”

257
258 **(XXV) Amend 503.03(L)(2) Impervious Membrane Curing** by revising the last
259 sentence of the second paragraph between lines 822 and 825 as follows:

260
261 “Do not apply membrane curing compound on surfaces to which concrete
262 is to be bonded or to which waterproofing or epoxy is to be applied.”

263
264 **(XXVI) Amend 503.03(M) Finishing Concrete Surfaces** by adding the following
265 sentences at line 841:

266
267 “No additional water shall be added to the concrete surfaces in an effort to
268 aid the finishing operation as the application of water to aid the finishing
269 operation will result in the rejection of the concrete pour. Finishing aids or
270 evaporation retarders may be used only with written authorization by the
271 Engineer. Only finishing aids shall be used to finish the concrete surface and
272 only evaporation retarders used to minimize the evaporation rate of the plastic
273 concrete. These solutions shall not be used interchangeably.”

274
275 **(XXVII) Amend 503.03(M)(3)(a)1. Machine Finishing** by adding the following
276 sentences at the end of the second paragraph at line 1021:

277
278 “The screed rails shall be adjustable for elevations. The screed shall be
279 set to elevations, with allowances for anticipated settlement, camber and
280 deflection, as required to form the surface of the bridge deck to the line and
281 grade shown in the contract. The Contractor shall install screed rail type such
282 that the rails shall not deflect appreciably under the applied loads. The supports
283 for the screed rails shall not be placed within the full width of the bridge.

284
285 The Contractor shall not apply any additional water to the deck surface in
286 an effort to aid his finishing operation. The unauthorized application of water will
287 result in the rejection of that day’s concrete placement.”

288
289 **(XXVIII) Amend 503.03(M)(3)(a)1. Machine Finishing** by deleting the last three
290 paragraphs between lines 1098 to 1111 and adding the following five
291 paragraphs:

292
293 “Concrete bridge decks, concrete sleeper slabs, and concrete approach
294 slabs shall be textured longitudinally by mechanical grooving. Grooves shall be
295 cut into the hardened concrete using a mechanical water-cooled diamond edge
296 blade saw device which shall produce straight uniformly spaced grooves spaced
297 at 3/4 inch. The groove width shall be 1/8 inch plus or minus 0.02 inch and the
298 groove depth shall be 1/8 inch plus 1/16 inch or minus zero inches.

299

300 If grooves cannot be cut into a continuous longitudinal operation, the
301 continuation of grooves shall be aligned such that joints are not visible.

302
303 Before grooves are cut into the accepted hardened concrete, the upper
304 1/8 inch of the concrete surface shall be removed by grinding. Grooving shall be
305 done after the concrete has attained sufficient strength to prevent spalling and
306 ravelling, and before the structure is opened to traffic.

307
308 A working drawing to control, collect and dispose of run-off water at an
309 accepted off-site facility shall be submitted to the Engineer.

310
311 The requirements of Section 411.03(N) Surface Test shall apply to
312 concrete bridge decks and concrete approach slabs. If additional grinding is
313 required to achieve the specified profile index, the grinding shall be performed
314 prior to the mechanical grooving and shall be done only in the longitudinal
315 direction.”

316
317 **(XXIX) Amend 503.03(M)(3)(b) Sidewalk and Median Strip** by revising the first
318 and second paragraphs from lines 1182 to 1191 to read as follows:

319
320 **(b) Sidewalks and Median Strips.** “Provide final finish for concrete
321 sidewalks and median strips using wooden float and broom finish. Do not plaster
322 surface. Use edging tool with ¼-inch radius to finish outside edges of sidewalk.
323 Finish sidewalk as plane surface with 2-percent (allowable construction tolerance
324 of plus or minus 0.4 percent maximum) cross slope towards roadway. Test
325 surface of concrete sidewalk with 10-foot straightedge. Correct any deviation in
326 excess of ¼ inch.”

327
328 **(XXX) Amend 503.03 Construction** by adding subsection 503.03(0) beginning
329 at line 1200 as follows:

330
331 **“(0) Tolerance for Concrete Construction and Materials.** Conform to
332 the stricter of tolerances specified in the specifications, ACI 117 Standard
333 Specifications for Tolerance for Concrete Construction and Materials, PCI
334 Tolerance for Precast and Prestressed Concrete, and PCI MNL-116 Manual for
335 Quality Control of Plants and Production of Structural Precast Concrete
336 Products.”

337
338 **(XXXI) Amend 503.04 Measurement** by revising lines 1201 to 1205 to read as
339 follows:

340
341 **“503.04 Measurement.** The Engineer will not measure concrete when
342 contracted on a lump sum basis.

343
344 The Engineer will not make deductions for the volume occupied by
345 reinforcing steel, piles, floor drains, weepholes, timber bumpers, pipes less

346 than eight (8) inches, conduits, or expansion joint materials.”

347

348 **(XXXII)** Amend **503.05 Payment** by revising lines 1206 to 1223 to read
349 as follows:

350

351 **“503.05 Payment.** The Engineer will pay for the accepted quantities of
352 concrete complete in place and the accepted mechanical grooving and grinding
353 at the contract lump sum price for the pay items listed below and contained in the
354 proposal.

355

356 The contract lump sum amount paid shall be full compensation for
357 mechanical grooving; for grinding upper concrete deck surface; for the concrete;
358 for placing, curing and finishing; for furnishing materials including admixtures and
359 cement (including extra cement added to concrete deposited under water); for
360 furnishing and installing drains, scuppers, premolded joint fillers, joint seals,
361 waterproofing at construction joints, waterstops, pipes and conduits; for
362 furnishing and installing metal rockers, anchor bolts, structural shapes for
363 expansion joints and other similar items; for timber bumpers, forms, form lining
364 and falsework or centering, bearing pads, structural steel bearing plates; and for
365 equipment, tools, labor, materials and incidentals necessary to complete the
366 work.

367

368 The Engineer will pay for the following pay item when included in the
369 proposal schedule:

370

Pay Item	Pay Unit
----------	----------

372

Concrete for _____ (Class _____ if applicable)	Lump Sum
---	----------

375

Mechanical Grooving and Grinding for _____	Lump Sum
---	----------

378

379 The Engineer will pay for excavation and backfill for foundations in accordance
380 with and under Section 205 – Excavation and Backfill for Bridge and Retaining
381 Structures and Section 206 – Excavation and Backfill for Drainage Facilities.”

382

383

END OF SECTION 503

1 **SECTION 504 - PRESTRESSED CONCRETE MEMBERS**

2
3 Make the following amendments to said Section:

4
5 **(I)** Amend **504.01 Description** by adding the following paragraph after line 7:

6
7 “Prestressed concrete members fabricated in a State other than Hawaii shall also
8 conform to that State’s Department of Transportation Standard Plans and Standard
9 Specifications. However, if conflicts between Hawaii State Specifications and that State’s
10 Plans and Specifications occur, the stricter provisions shall govern unless otherwise
11 permitted by the Engineer.”

12
13 **(II)** Amend **504.02 (A) Portland Cement Concrete** by revising the number 893 at line
14 24 to read 800.

15
16 **(III)** Amend **504.03 (A)(1) Design** by revising the title and the first paragraph between
17 lines 55 and 57 to read as follows:

18
19 “(1) Design and Construction. Design, fabricate and erect prestressed members
20 in accordance with AASHTO LRFD Bridge Design Specification and AASHTO LRFD Bridge
21 Construction Specifications including the latest interim revision. Construction shall also
22 conform to Section 503-Concrete Structures and Section 602-Reinforcing Steel.”

23
24 **(IV)** Amend **504.03 (A)(1) Design** by revising the number 70 in the fourth paragraph at
25 line 76 to read 75.

26
27 **(V)** Amend **504.03 (A)(2) Shop Drawings** by revising the entire paragraph between
28 lines 112 and 122 to read as follows:

29
30 “(2) Shop Drawings. Prior to casting prestressed members, submit 10 copies of
31 shop drawings, including complete outline and details of the following: prestressing method;
32 materials; pattern of prestressing steel; post-tensioned duct location calculations;
33 elongation calculations; sequence of stressing and releasing; complete specifications and
34 details of prestressing steel and anchoring devices; anchoring stresses; type of enclosure;
35 handling, shipping, storage, bracing, transportation and delivery; and other data for
36 prestressing operation. Prestressing operation includes proposed arrangement of
37 prestressing materials, and equipment. Obtain shop drawing acceptance prior to casting.

38
39 The shop drawings for the supports for the temporary truss which may be used to
40 install the girders and the operational details for such installation shall be stamped by a
41 Hawaii licensed structural engineer. The foundation details and calculations for the truss
42 supports shall be stamped by a Hawaii licensed civil engineer specializing in geotechnical
43 engineering.”

44
45 **(VI)** Amend **504.03 (A)(5) Tolerances** by revising the title to read Tolerances and
46 Cambers and by adding a third paragraph at line 153 as follows:

48 “Submit records of monthly measurements of the member cambers and of a final
49 measurement just prior to placing the member onto the substructure. The Contractor shall
50 also submit a record of the member cambers after the pretensioning has been completed
51 and prior to splicing the members.”

52
53 **(VII) Amend 504.03 (A)(6) Form Fabrication** by deleting the last paragraph between
54 lines 166 and 170.

55
56 **(VIII) Amend 504.03 (C) Prestressing Steel** by adding the following sentence at line 246
57 of the seventh paragraph:

58
59 “The maximum tensile stress (jacking stress) in prestressing steel shall not exceed
60 75 percent of the specified minimum ultimate tensile strength of the prestressing steel.”

61
62 **(IX) Amend 504.03 (C) Prestressing Steel** by adding the following sentence after the
63 first sentence of the penultimate paragraph at line 255 to read as follows:

64
65 “The force provided shall not be less than the force shown on the plans.”

66
67 **(X) Amend 504.03 (I) Handling, Storage, and Transportation** by revising the first
68 sentence of the sixth paragraph between lines 622 and 624 to read as follows:

69
70 “Make provisions for supporting prestressed concrete with adequate bracing to
71 maintain vertical and horizontal positions and to dampen vibration during all stages of work
72 prior to the final set of the concrete in the diaphragms or transverse beams between the
73 prestressed concrete members.”

74
75 **(XI) Amend 504.04 – Measurement** by revising lines 649 to 650 to read as follows:

76
77 **“504.04 Measurement.** The Engineer will measure the prestressed concrete
78 members per each when contracted on a unit price basis.”

79
80 **(XII) Amend 504.05 Payment** by revising lines 652 to 664 to read as follows:

81
82 **“504.05 Payment.** The Engineer will pay for the accepted quantities of prestressed
83 concrete members per each as shown in the proposal.

84
85 The price shall be full compensation for furnishing the shop drawings; getting an
86 authorized person of the company making the members; welding; fabricating; tensioning;
87 placing concrete; curing; grouting; taking safety measures; handling, storing, and
88 transporting; placing; and furnishing materials, labors, equipment, tools and incidentals
89 necessary to complete the work.

90
91 The Engineer will pay for the following pay item when included in the proposal
92 schedule:

	Pay Item	Pay Unit
95		
96		
97	Prestressed Concrete Girder for _____	Each”
98		
99		
100		
101	END OF SECTION 504	

1 **SECTION 507 - RAILINGS**

2
3 Make the following amendments to said Section:

4
5 **(I)** Amend **507.04 – Measurement** by revising lines 171 to 172 to read as
6 follows:
7

8 **“507.04 Measurement.** The Engineer will measure bridge concrete railings
9 of the various types by the linear foot. The Engineer will make the measurement
10 along the centerline and from end to end of the railing. The Engineer will
11 measure end posts per each in accordance with the contract documents.”
12

13 **(II)** Amend **507.05 Payment** by revising lines 174 to 186 to read as follows:
14

15 **“507.05 Payment.** The Engineer will pay for the accepted bridge concrete
16 railings by the linear foot and the accepted concrete end post railings per each.
17 Payment will be full compensation for the work prescribed in this section and the
18 contract documents.
19

20 The Engineer will pay for each of the following pay items when included in
21 the proposal schedule:
22

Pay Item	Pay Unit
Bridge Concrete Railings for _____	Linear Foot
Concrete End Post Railing for _____	Each

28
29 The Engineer will pay for portions of railing bars that extends into slabs or
30 beams under Section 602 – Reinforcing Steel.”
31
32

33 **END OF SECTION 507**

1 Amend **Section 511 - Drilled Shafts** to read as follows:
2
3

4 **“SECTION 511 - DRILLED SHAFTS**
5

6
7 **511.01 Description.** This section is for installing, drilling, reinforcing, concreting
8 and crosshole sonic logging of drilled shafts in the locations shown on the plans.
9

10 **511.02 Materials.** Materials shall conform to the following:
11

12 **(A) Portland Cement Concrete.** Concrete shall conform to Section 601 -
13 Structural Concrete and Section 511 – Drilled Shafts.
14

15 The in-place concrete shall have minimum 28-day compressive strength
16 $f'_c = 5000$ pounds per square inch and maximum water to cement ratio of 0.45.
17

18 Proportion the concrete mix designs to get properties of high workability,
19 compaction under self-weight, resistance to segregation, and resistance to
20 excessive bleeding. The maximum nominal aggregate size shall be 3/4 inch.
21 The slump range shall be 7.0 inches \pm 1.0 inch for concrete poured into a water
22 free borehole and 8.0 inches \pm 1.0 inch for concrete placed under water or under
23 drilling slurry. Slump for the concrete shall be a minimum of four inches after four
24 hours from initial mixing or after the completion of the concrete placement,
25 whichever occurs later.
26

27 A migrating corrosion inhibiting amine carboxylate water-based admixture
28 shall be added to the concrete. The minimum dosage shall be 1.5 pints per cubic
29 yards of concrete.
30

31 The Engineer will permit superplasticizers.
32

33 At the time of placement, the concrete temperature shall not exceed 85°F.
34

35 The final concrete mix design shall be based on field trial batches to
36 determine the most suitable materials and proportions that will provide a concrete
37 mixture having the least amount of segregation and bleeding, and at the same
38 time provide the necessary workability to meet placing requirements.
39

40 **(B) Reinforcing Steel.** Reinforcing steel shall conform to Section 602 -
41 Reinforcing Steel.
42

43 **(C) Casings.** Casings shall have inside diameters not less than the
44 required diameter of the shafts and wall thicknesses specified or adequate to
45 withstand construction loads and stresses.
46

47 **(D) Cement Grout.** Cement grout used for setting the expandable load
48 cells and for filling the access tubes after completion of crosshole sonic logging
49 tests and cored holes, shall be prepackaged, non-shrink, and non-metallic grout

50 with the same strength as the drilled shaft concrete. The grout shall contain 10
51 grams of water-based migrating amine carboxylate corrosion inhibitor per 0.5
52 cubic feet. Cement grout used to fill cored holes shall be extended with 3/8 inch
53 pea gravel per manufacturer's recommendations.

54
55 **(E) Crosshole Sonic Logging (CSL) Test Access Tube.** Access tube
56 shall be at least 2-inch inside diameter, Standard steel pipe conforming to ASTM
57 A53, Grade B, Type E.
58

59 Access tube shall have round, regular inside diameter, free of defects and
60 obstructions, including all pipe joints, in order to permit free unobstructed
61 passage of 1.375-inch maximum diameter source and receiver probes used for
62 crosshole sonic logging testing. Access tube shall be watertight, free from
63 corrosion, with clean internal and external faces to ensure good bonding between
64 the drilled shaft concrete and access tubes. Fit access tubes with watertight
65 caps on bottom and top. Both ends of the access tube shall be capped at all
66 times except when being connected to another access tube. The end of the
67 tubes shall be undamaged and suitably prepared for the end caps and coupling
68 system adopted. Access tube coupling shall be used when extension of the
69 access tubes is necessary. The access tube coupling shall be watertight.
70

71 When crosshole sonic logging testing is indicated in the contract
72 documents, submit manufacturer's certificate of compliance for the acceptance of
73 the access tube.
74

75 **511.03 Construction.**

76
77 **(A) Qualifications of Drilled Shaft Contractor.** Be capable of installing
78 drilled shafts, conducting load tests and other related work as specified in the
79 contract and shall have the following minimum experience requirements below.
80

81 Because of the expertise required to successfully complete the drilled shafts
82 according to the contract, a qualified drilled shaft Contractor shall install the
83 drilled shaft. The drilled shaft Contractor shall have installed at least three
84 projects completed in the last three years on which the Contractor has installed a
85 minimum of five drilled shafts per project of a diameter and length similar to those
86 shown in the contract.
87

88 **(B) Experience Information.** Submit the following information to the
89 Engineer within 30 days after award of contract for acceptance by the Engineer:
90

91 **(1)** List of drilled shaft projects completed in the past 10 years. The list
92 of projects shall contain the names and phone numbers of owner's
93 representatives who can verify participation on that project. The drilled
94 shaft Contractor shall have installed at least three projects completed in
95 the last three years on which the Contractor has installed a minimum of
96 five drilled shafts per project of a diameter and length similar to those
97 shown in the contract.
98

99 (2) Name and experience record of the drilled shaft superintendent
100 who will be in charge of drilled shaft operations for this project. Drilled
101 shaft superintendent shall have minimum three years' experience within
102 the last 10 years in drilled shaft construction similar to type proposed.
103 Drilled shaft superintendent shall remain on the project for the duration of
104 the drilled shaft work. Drilled shaft superintendent who leaves the project
105 shall be replaced with personnel with equal or better experience. Submit
106 proposed superintendent's name and experience record for acceptance.
107

108 **(C) Protection of Existing Structures.** Prevent damage to existing
109 structures and utilities. Preventive measures shall include:

110
111 (1) Selecting construction methods and procedures that will prevent
112 caving of the shaft excavation and
113

114 (2) Monitoring and controlling the vibrations from construction activities
115 such as the driving of casing or sheeting or drilling of the shaft
116

117 **(D) Installation Plan.** At least 30 days before constructing the drilled
118 shafts, submit an installation plan for acceptance by the Engineer. This plan shall
119 at a minimum provide information on the following:

120
121 (1) List of proposed equipment such as cranes, drills, augers, bailing
122 buckets, final cleaning equipment, concrete pumps, and casing,
123

124 (2) Details of construction operation sequence and the sequence of
125 shaft construction in bents or groups,
126

127 (3) Details of shaft excavation methods including how the excavated
128 material from the drilled shaft will be controlled on site and removed; and
129 method of setting and extracting temporary casing,
130

131 (4) If the Contractor plans to use slurry, details of the methods to mix,
132 circulate and desand slurry,
133

134 (5) Details of methods to clean the shaft excavation,
135

136 (6) Details of reinforcement placement including lifting, support, and
137 centralization methods,
138

139 (7) Details of concrete placement including proposed operational
140 procedures for pumping method,
141

142 (8) Details of attaching the crosshole sonic logging test access tubes to
143 the reinforcing cage, details of testing access tubes for leakage after cage
144 installation and prior to shaft concrete placement, and details for grout
145 placement in the crosshole sonic logging test access tubes after testing is
146 completed,
147

148 (9) Details of required load tests, including equipment, procedures, and
149 recent calibrations for jacks or load cells supplied by the Contractor,
150

151 (10) Proposed concrete mix design, including expected strengths at 3,
152 7, 14 and 28 days. Concrete mix design shall minimize segregation and
153 bleed. Submit test results of both a trial mix and a slump loss test,
154 conducted by State-accepted testing laboratory using methods specified in
155 Section 601 - Structural Concrete. Tests shall demonstrate that concrete
156 meets 4-hour plasticity requirement at expected ground ambient
157 temperature and at highest expected ambient air temperature (two
158 separate slump loss tests required), and
159

160 (11) Test results from laboratory measurements of the ultrasonic pulse
161 velocity, performed in accordance with ASTM C 597, on 3-day, 7-day, and
162 28-day concrete trial mix samples described in Subsection 511.03(D)(10).
163

164 The Engineer will evaluate the drilled shaft installation plan for
165 conformance with the contract documents. Within 30 days after receipt of
166 the plan, the Engineer will notify the Contractor of additional information
167 required including if applicable, changes necessary to meet the contract
168 requirements. The Engineer will reject parts of the installation plan that
169 are unacceptable. The Contractor shall resubmit changes for
170 re-evaluation within 15 days. The Engineer will have another 30 days to
171 review all resubmittals. Procedural acceptance given by the Engineer
172 shall be subject to trial in the field. The acceptance shall not relieve the
173 Contractor of the responsibility to complete the work according to the
174 contract.
175

176 **(E) Trial Shaft Installation.** Demonstrate adequacy of proposed methods
177 and equipment by successfully constructing a trial shaft of the shaft diameter to
178 be installed, in accordance with contract documents. The details of trial shaft
179 shall be the same as for the production drilled shafts. Position trial shaft away
180 from production shafts, at location shown in the contract documents, or as
181 ordered by the Engineer. Drill trial shaft to the depth shown on the contract
182 documents.
183

184 CSL test access tubes shall be installed in the trial shaft as shown on the
185 contract to allow performance of CSL tests. Installation of the CSL tubes shall be
186 in accordance with Subsection 511.03(N) - Crosshole Sonic Logging (CSL) Test
187 Access Tubes and shall be incidental to the trial shaft work.
188

189 The trial shaft shall be subject to integrity testing using concrete coring to
190 evaluate the effectiveness of the concrete placement method proposed by the
191 Contractor. Coring shall be conducted by the Contractor in the presence of the
192 Engineer. The Contractor shall core a vertical hole beginning four feet above the
193 top of drilled shaft (cutoff elevation) and ending at bottom of drilled shaft at two
194 locations of the trial shaft determined by the Engineer. Core specimens shall be a
195 minimum diameter of 3.75 inches. The Contractor shall submit the coring
196 samples to the Engineer in core boxes properly labeled with the core number and
197 depths. Coring of the trial shaft shall be incidental to the trial shaft work.

198
199
200
201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224
225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
240
241
242
243
244
245
246
247

If the Engineer rejects trial shaft due to deviation from requirements of the contract documents, alterations to proposed methods and equipment may be required. Drill additional trial shaft holes to demonstrate adequacy of altered construction methods or equipment at no increase in contract price or contract time. Once the Engineer has accepted trial shaft and has authorized construction of production shafts, do not deviate from accepted methods or equipment without the Engineer's written approval.

Fill trial shaft hole with concrete similar to the construction of production shafts, using method proposed for production shaft construction. Cut the concreted trial shafts off 24 inches below finished grade and leave in place. Restore disturbed areas at trial shaft sites to original condition, unless otherwise specified.

(F) Drilled Shaft Load Tests. Load test shall be performed at the location shown on the plans and be completed after the trial shaft but before construction of any production drilled shafts. This work includes all labor, materials, equipment and services necessary for conducting the bi-directional axial load tests and reporting the results, including the following: (a) the number of bi-directional expandable load cells as indicated on the plans, (b) materials to construct a stable reference beam system(s) for monitoring vertical and horizontal deflection of the drilled shaft during testing, supported a minimum distance of the reference system, (c) materials sufficient to construct and protect the work area, load test equipment, and personnel from inclement weather and sunlight, and illuminate area as needed, (d) electric power as required and suitable for lights, welding, instruments, etc., and (e) suitable optical survey equipment to measure the horizontal and vertical displacement of shafts during tests independent of the reference beam(s) and electronic equipment.

(1) Experience Requirements. The Contractor shall obtain the services of an experienced specialty Subcontractor with a minimum of three years of bi-directional load testing experience accepted by the Engineer to direct the assembly and instrumentation of the load cells, and to record all data and furnish results of the test to the Engineer.

(2) Materials. Materials for the drilled shaft load test shall conform to the requirements of Section 511.02 - Materials.

(3) Load Test Instrumentation. Provide instrumentation consisting of vibrating wire embedment strain gauges connected to a central data collection terminal; expandable load cell with readout device, and/or other equipment specified or indicated to measure movement of the top and bottom plates of the load cell, top of shafts, and strain at indicated locations within the shaft.

The embedment strain gauges shall be positioned along the test shaft at intervals shown on the Plans. The embedment strain gauges shall be attached securely to prevent movement from the installed location. The Engineer may require relocation of the embedment strain

248 gauges and load cell based on the submittals provided by the Contractor.
249 Each embedment strain gauge shall be capable of measuring strain to the
250 nearest 0.0001 inch/inch and shall be capable of measuring or
251 compensating for temperature. All embedment strain gauges shall have
252 been calibrated or certified as accurate prior to installation. Take
253 precautions not to damage the embedment strain gauges.
254

255 Load cell shall be a flat, hydraulically expandable load cell of a
256 minimum of 26 inches in diameter and capable of applying a load test of at
257 least 3,600 kips in each direction. The load cell shall be accurate to
258 within 1%, shall expand uniformly, and shall be capable of being installed
259 as described herein. The load cell shall have provisions for monitoring
260 displacements of the upper and lower plates to an accuracy of 0.001 inch.
261 The load cell shall have been calibrated or certified as accurate to within
262 1% of the true loads not more than six months prior to installation.
263

264 **(4) Construction Requirement.** The drilled shaft load test shall be a
265 bi-directional load test utilizing a hydraulically expanded load cell. The
266 bi-directional load test separately tests the shear resistance and end-
267 bearing of the drilled shaft by loading the shaft in two directions (upward-
268 shear resistance, downward-end bearing and shear resistance), using
269 hydraulically expanded load cell, or by loading the shaft using other
270 accepted methods capable of full separation of the shear bearing
271 components. The drilled shaft used for the load test program shall be
272 instrumented, as specified in Section 511 – Drilled Shafts, by an
273 experienced specialty Subcontractor accepted by the Engineer. Load test
274 shaft with excessive lateral extension (more than 12 inches) of the shaft
275 diameter will be rejected, unless accepted by the Engineer. Rejected load
276 test shaft shall be replaced at no additional cost to the State.
277

278 The Contractor shall supply equipment required to install the load
279 cell, conduct the load test, and remove the load test apparatus as
280 required. For the drilled shaft load test, the following set up procedure
281 shall be used:
282

283 **(a)** The load cell, piping and other attachments will be
284 assembled and made ready for installation under the direction of
285 the specialty Subcontractor, in a suitable area, adjacent to the load
286 test shaft, to be provided by the Contractor. The load cell
287 assembly shall be placed at the location shown on the plans in
288 conjunction with the construction of the reinforcing cage. The
289 Engineer reserves the right to adjust the location of the load cell
290 prior to installation.
291

292 **(b)** Advance the load test excavation to the maximum depth
293 shown on the plans. A successfully completed trial shaft that is
294 acceptable to the Engineer may not be used as the load test shaft.
295

296
297
298
299
300
301
302
303
304
305
306
307
308
309
310
311
312
313
314
315
316
317
318
319
320
321
322
323
324
325
326
327
328
329
330
331
332
333
334
335
336
337
338
339
340
341
342
343

(c) Clean the bottom of the shaft excavation after drilling is complete.

(d) Caliper testing shall be performed on the load test shaft to obtain profile shape data to be used to verify the shaft verticality and diameter. A minimum of eight data points around the circumference of the load test shaft shall be obtained at every one foot increment throughout the depth of the load test shaft. Caliper testing may be performed using a sonar-type caliper.

(e) Install the rebar cage assembly and load cell under the direction of the specialty Subcontractor and in the presence of the Engineer. The Contractor shall use the utmost care in handling the rebar cage/test equipment assembly so as not to damage the instrumentation during installation.

(f) After the installation of the rebar cage/test equipment assembly, the drilled shaft shall be concreted in the same manner as accepted by the Engineer based on the trial shaft installation and as specified for production shafts.

(5) Load Test Schedule. The Contractor shall notify the Engineer of the load testing schedule a minimum of fifteen calendar days prior to the commencement of load testing.

(6) Load Test Procedures. The load test shall be completed and the load test data evaluated by the Engineer for revision to the production shaft length before construction of any production shafts. The Engineer shall have at least 21 calendar days after submission of the load test report to review the load test result prior to providing the production shaft lengths. Load testing on the shaft shall not begin until the concrete has attained a compressive strength of 4,000 psi and aged for seven days.

Load the load test shaft using the quick load test method of ASTM D1143 except as modified herein. Apply the test load in increments of 50 to 100 kips, as directed by the Engineer. A load-deflection curve shall be plotted as the test progresses to avoid missing information near the failure load or to correct the precise load increments.

The load test shall be conducted to the maximum test load of 3,000 kips or plastic failure, whichever occurs first. Plastic failure is defined as the load corresponding to mobilization of side shear or end bearing and no further increase in load can be obtained.

The load test shall be held for a minimum of 4 hours each at the 2,000, 2,500, and 3,000-kip load interval to evaluate the creep effects, or at specific loads as directed by the Engineer.

344 (7) **Cleanup.** After completion of the load test, and at the direction of
345 the Engineer, the Contractor shall remove all equipment, waste and other
346 material that is not a part of the finished structure. The load cell
347 remaining in the shafts shall then be grouted through the piping provided
348 as a part of the load cell assembly. Use non-shrink, non-metallic, non-
349 gaseous grout of the same strength as the drilled shaft concrete.

350
351 After completing the test, cut off the load test shafts at an elevation
352 24 inches below the finished ground surface. The portion of the shafts
353 cut off and removed shall remain the property of the Contractor.

354
355 (8) **Replacement.** Load test shaft found inadequate because of
356 improper or failure of instrumentation, testing or construction procedures
357 shall be replaced and retested, at no additional cost to the State.

358
359 (9) **Reporting.** Report the test results as specified in ASTM D1143-
360 81 including, but not limited to, the following:

361 (a) Introduction;

362 (b) Drilled shaft installation procedure;

363 (c) Load test procedure and instrumentation; and

364 (d) Appendix which shall include report of calibration of
365 instruments, plan view location of the load test and test boring
366 related to the Project, records of subsurface exploration, records of
367 load test shaft installation, tabular and graphical presentation of the
368 load-deflection data of end-bearing and side shear from the load
369 test.

370
371 (G) **Construction Sequence.** Complete the excavation to footing
372 elevations before shaft construction begins. Repair the disturbances caused by
373 shaft installation to the footing area before pouring the footing.

374
375 When installing drilled shafts with embankment placement, construct
376 drilled shafts after the placement of fills.

377
378 Do not cap the drilled shafts before placing the fills as near to final grade
379 as possible. Only leave room for construction of the caps.

380
381 (H) **Construction Methods.** Excavate for shafts to the dimensions and
382 elevations shown in the contract. Its methods and equipment shall be suitable
383 for the intended purpose and materials met. Use the permanent casing method
384 only when required by the contract or authorized by the Engineer. Blasting shall
385 not be permitted.

386
387 (I) **Dry Construction Method.** The dry method includes drilling the
388 shaft excavation, removing accumulated water and loose material from the
389

393 excavation, and placing the reinforcing cage and shaft concrete in a dry
394 excavation. Use this method only at sites where the groundwater table
395 and soil conditions are suitable to permit construction of the shaft in a dry
396 excavation. The Engineer will inspect the sides and bottom of the shaft
397 visually before placing the concrete. Dry excavation is defined as an
398 excavation where maximum depth of water does not exceed 3 inches.
399

400 **(2) Wet Construction Method.** This method includes using water,
401 mineral, or polymer slurry to maintain stability of the hole perimeter while
402 advancing the excavation to final depth, placing the reinforcing cage, and
403 concreting the shaft. Use this method at sites where a dry excavation for
404 placement of the shaft concrete cannot be maintained
405

406 Reuse drilling water only if permitted by the Engineer and
407 contingent upon control of unit weight to no more than 62.5 pounds per
408 cubic foot and Marsh funnel viscosity to not more than 27 seconds per
409 quart, at the time drilling water is introduced into the borehole.
410

411 When locating drilled shafts in open water areas, extend the
412 exterior casings from above the water elevation into the ground. Install
413 the exterior casing to produce a positive seal at the bottom of the casing
414 so that no intrusion or extrusion of water or other materials occurs into or
415 from the shaft excavation.
416

417 **(3) Casing Construction Method.** The casing method may be used
418 when shown in the contract or at sites where the dry or wet construction
419 methods are inadequate. The casing may be placed either in a predrilled
420 hole or advanced through the ground by twisting, driving, before cleaning
421 the casing.
422

423 **(I) Excavation.**
424

425 **(1) General.** Make the shaft excavations at locations, and to shaft
426 geometry and dimensions shown in the contract. After acceptance by the
427 Engineer, adjust drilled shaft tip elevations when the material met during
428 excavation is unsuitable and/or differs from that anticipated in the design
429 of the drilled shaft.
430

431 Maintain a construction method log during shaft excavation. Submit
432 method log within 24 hours of shaft drilling completion. The log shall
433 contain information such as:

- 434 **(a)** Excavation diameters;
- 435
- 436 **(b)** Equipment used;
- 437
- 438 **(c)** Type of material excavated with the elevations of the
439 material;
440
441

- 442 (d) Rate of excavation including time drilling started, when
443 different material is encountered, tool changes, finish of shaft
444 excavation, and difficulties encountered;
445
446 (e) The description of and approximate top and bottom elevation
447 of each soil or rock material encountered.
448
449 (f) Elevation and approximate rate of any seepage or
450 groundwater; and
451
452 (g) Remarks, including temporary stoppages
453

454 Drilling of shafts within a horizontal distance of 3.0 times the shaft
455 diameter to the hole being drilled shall not commence until a minimum of
456 24 hours after the drilled shaft has been completed by placement of
457 concrete to the top of shaft elevation in order to avoid interaction effects
458 between adjacent shafts.
459

460 On projects with cofferdams, provide a qualified diver to inspect the
461 cofferdam conditions when the contract requires a seal for construction.
462 Before placing the concrete seal, the diver shall inspect the cofferdam
463 interior periphery. The cofferdam interior periphery inspection includes
464 each sheeting indentation and around each drilled shaft.
465

466 Any drilled shaft concrete over the theoretical amount required to fill
467 any excavations for the shafts dimensioned on the plans shall be
468 furnished at no additional cost.
469

470 Dispose the excavated material according to Section 203 -
471 Excavation and Embankment.
472

473 Furnish drilled shaft concrete required to fill excavations for shafts
474 dimensioned in the contract documents.
475

476 Do not permit workers to enter the shaft excavation unless:
477

- 478 (a) A suitable casing is in place.
479
480 (b) The water level is lowered and stabilized below the level the
481 workers will occupy, and
482
483 (c) Adequate safety equipment and procedures are provided,
484 performed and in place.
485

486 **(2) Excavation and Drilling Equipment.** The excavation and
487 drilling equipment shall have adequate capacity including power, torque,
488 and down thrust to excavate a hole to the maximum diameter and to a
489 depth of ten feet or 20% beyond the depths shown in the contract,
490 whichever is greater.

491
492 The use of special drilling equipment and/or procedures will be
493 necessary to drill through the cobbles and boulders. The Contractor shall
494 anticipate an abundance of boulders or various sizes in deposits classified
495 as "fill" and "older alluvium" on the boring logs and shall make allowance
496 for difficult drilling in his bid. In addition, the Contractor shall make
497 allowance for difficult drilling in his bid within the basalt rock formation.
498

499 The excavation and overreaming tools shall be of adequate design,
500 size, and strength to do the work shown in the contract.
501

502 **(a) Special Drilling Equipment.** When conventional earth
503 augers and/or underreaming tools cannot be used for drilling,
504 provide special drilling equipment including rock core barrels, rock
505 tools, air tools and other equipment as necessary to construct the
506 shaft excavation to the size and depth required. The use of special
507 drilling equipment and/or procedures will be necessary to drill
508 through the cobbles and boulders, and cost shall be incidental to
509 unclassified shaft excavation.
510

511 **(b) Sidewall Overreaming.** When the sidewall of the hole
512 has softened, swelled, or degraded, sidewall overreaming will be
513 required by the Engineer. Overreaming thickness shall be a
514 minimum of 0.5 inch and a maximum of 3.0 inches. The Contractor
515 may overream with a grooving tool or overreaming bucket. The
516 thickness and elevation of sidewall overreaming shall be according
517 to the contract or as directed by the Engineer. Overream sidewall
518 and place additional shaft concrete at no cost to the State.
519

520 **(3) Unclassified Excavation.** All excavation for the production
521 drilled shafts shall be designated as unclassified. The Contractor shall
522 anticipate the presence of cobbles and boulders within the depths of the
523 drilled shafts. The Contractor shall provide the necessary equipment to
524 remove and dispose of materials met in forming the drilled shaft
525 excavation, including installation of temporary casing and/or use of slurry,
526 as necessary. The Engineer will not make separate payment for
527 excavation of materials of different densities and character (hardness) or
528 employment of special tools and procedures necessary to excavate. The
529 Engineer will pay for obstruction removal separately.
530

531 **(4) Obstructions Removal.** Remove obstructions at drilled shafts
532 locations when authorized by the Engineer. Obstructions shall include
533 man-made materials such as but not limited to old concrete foundations
534 not shown on the Plans.
535

536 The Contractor shall employ special procedures and/or tools after
537 the Contractor cannot advance the hole using conventional augers fitted
538 with soil or rock teeth, drilling buckets, core barrels and/or underreaming
539 tools. Such special procedures/tools may include: chisels, boulder

540 breakers, air tools, hand excavation, temporary casing, and increasing the
541 hole diameter.

542
543 Drilling tools and any other equipment, lost in excavation, are not
544 considered obstructions. Remove the drilling tools and any other
545 equipment promptly. The cost due to tools lost in the excavation shall be
546 at no additional cost to the State including costs associated with hole
547 degradation (requiring overreaming or other methods) due to removal
548 operations or the time the hole remains open or any other remedial
549 actions needed to be performed to correct the situation caused by the tool
550 lost.

551
552 Natural materials used as fill materials such as cobbles and
553 boulders shall be anticipated at the site during excavation and shall not be
554 considered an obstruction regardless of the size and hardness of the
555 boulder. These natural materials used as fill materials shall not be
556 considered an obstruction under this section.

557
558 **(J) Casings.**

559
560 **(1) General.** Casings shall be steel conforming to ASTM A252,
561 Grade 3, smooth, watertight, and of ample strength to withstand both
562 handling and driving stresses and the pressure of concrete and the
563 surrounding earth materials. The inside diameter of the casing shall not
564 be less than the specified size of the shaft. The Engineer will not allow
565 extra compensation for concrete required to fill the oversized casing or
566 oversized excavation. Remove casings from shaft excavations except
567 when the casing is permanent. If the Contractor elects to pre-drill for the
568 permanent casing, the pre-drilled hole diameter shall be no larger than the
569 outside diameter of the permanent casing. The Contractor shall take
570 proper measures and shall be responsible for maintaining the tip elevation
571 of the permanent casing at the specified elevations.

572
573 When the shaft extends above ground or through a body of water,
574 the shaft may be formed with removable casing except when the casing is
575 permanent. Remove the casing carefully, where specified, so that the
576 casing will not damage the cured concrete. When the casing needs to be
577 removed after the concrete hardens in open water, design and submit the
578 special system for acceptance by the Engineer. The Contractor may
579 remove the casings only when the concrete attains sufficient strength
580 provided:

581
582 **(a)** The curing of the concrete continues for the full 72 hour
583 period,

584
585 **(b)** The shaft concrete is not exposed to salt water or moving
586 water for a minimum of 7 days after placement, and

587

588 (c) The concrete reaches a compressive strength of at least
589 2,500 pounds per square inch.

590
591 **(2) Temporary Casing.** The Engineer will consider subsurface
592 casing temporary unless shown in the contract as permanent casing.
593 Remove the temporary casing before completing the placing of concrete in
594 the drilled shaft. The Contractor may require telescoping, predrilling with
595 slurry, and/or overreaming to beyond the outside diameter of the casing to
596 install casing.

597
598 When choosing to remove a casing and substituting a longer or
599 larger diameter casing through caving soils, stabilize the excavation with
600 slurry or backfill before installing the new casing.

601
602 Before withdrawing the casing, the level of fresh concrete in the
603 casing shall be the higher of the following:

- 604
605 (a) Minimum of five feet above the hydrostatic water level, or
606
607 (b) Level of drilling fluid, outside the casing.

608
609 While withdrawing the casing, maintain an adequate level of
610 concrete within the casing to:

- 611
612 (a) Displace the fluid trapped behind the casing upward and
613
614 (b) Discharge the fluid at the ground surface without
615 contaminating or displacing the shaft concrete.

616
617 When temporary casings become bound or fouled during shaft
618 construction and cannot be removed, the Engineer will consider the drill
619 shaft defective. Improve such defective shafts according to the contract or
620 submit remedial repair for acceptance by the Engineer. Such
621 improvement may consist of removing the shaft concrete and extending
622 the shaft deeper, providing straddle shafts to compensate for capacity
623 loss, or providing a replacement shaft. Do corrective measures including
624 redesign of footings caused by defective shafts according to the contract
625 at no cost to the State or extension of the contract time. Any redesign of
626 the footing shall be submitted to the Engineer for acceptance. The
627 redesign shall be performed by a structural engineer and a civil engineer
628 specializing in the geotechnical practice both licensed in the State of
629 Hawaii. All remedial repairs shall have drawings and calculations signed
630 and stamped by both of the above licensed engineers. The Engineer will
631 not pay for the casing remaining in place as well as any redesign or
632 remedial repair.

633
634 **(K) Slurry.** If required, use only polymer slurry in the drilling process. The
635 polymer slurry shall have sufficient viscosity and gel characteristics to transport
636 excavated material to suitable screening system. The percentage and specific

637 gravity shall be sufficient to maintain the stability of the excavation and to allow
638 proper concrete placement.

639
640 During construction, maintain the level of the slurry at a height sufficient to
641 prevent caving of the hole. When a sudden significant loss of slurry occurs,
642 delay the construction of that foundation until an alternate construction procedure
643 is submitted for acceptance by the Engineer.

644
645 Premix the polymer slurry thoroughly with clean fresh water in slurry tanks
646 and adequate time (as prescribed by the manufacturer) allotted for dehydration
647 before introducing the slurry by pumping into the shaft excavation. The slurry
648 tanks shall have capacity for adequate slurry circulation, storage, and treatment.
649 Excavated slurry pits in lieu of slurry tanks will not be allowed without the written
650 permission of the Engineer.

651
652 Use desanding equipment to control slurry sand content to less than 0.5%
653 by volume in the borehole for polymer slurry. The Engineer will not require
654 desanding equipment for setting temporary casing, sign post, or lighting mast
655 foundations.

656
657 Prevent the slurry from "setting up" in the shaft, such as: agitation,
658 circulation and/or adjusting the properties of the slurry. Dispose of slurry in
659 suitable areas off from the project site.

660
661 The Contractor shall have the representative from the manufacturer of the
662 slurry product on site providing the technical support for the slurry preparation,
663 placement, testing and other quality control. Carry out the control tests using
664 suitable apparatus on the polymer or mineral slurry to resolve the density,
665 viscosity, pH, and sand content. Acceptable range of values for those physical
666 properties for two types of polymer slurries is in Tables 511-1 - Shore Pac GCV
667 (CETCO Drilling Products Group) IN FRESH WATER and 511-2 - SLURRYPRO
668 CDP (KB Technologies Ltd.) IN FRESH WATER.

669
670 Test the density, viscosity, and pH value during the shafts excavation to
671 establish a consistent working pattern. Make a minimum of four sets of tests
672 during the first 8 hours of slurry use. When the results show consistent behavior,
673 decrease the testing frequency to one set every four hours of slurry use.

674

675
676
677
678

TABLE 511-1 - Shore Pac GCV (CETCO Drilling Products Group) IN FRESH WATER			
Property	Range of Values *		Test Method
	Time of Slurry Introduction	In Hole At Time Of Concreting	
Density (pcf)	Less than or equal to 64.0**	Less than or equal to 64.0**	Density Balance
Viscosity (sec/qt)	33 - 74	Less than or equal to 57	Marsh Cone
PH	8.0 – 11.0	8.0 – 11.0	pH paper pH meter

* At 20^o C
** Increase by two pounds per cubic foot in salt water

Notes: a. When the Contractor does not need to control the bottom hole conditions or when tests show that other criteria are appropriate, the Engineer may modify the values.

b. When the contract requires desanding, the sand content shall not exceed 0.5% percent (by volume) in the bore hole as resolved by the American Petroleum Institute sand content test.

c. Submit changes for acceptance in writing by the Engineer.

d. Increases in the viscosity of polymer slurry beyond the above acceptable ranges during drilling may be allowed by the Engineer. However, increases in the viscosity of the polymer slurry beyond the above acceptable ranges during concrete placement will not be allowed. Use of other polymer materials that increase the cohesion of the soil material, or other construction methods to reduce the slurry viscosity just prior to concrete placement may be considered in-lieu of increasing the viscosity of the slurry.

679
680
681

682
683
684
685

TABLE 511-2 - SLURRYPRO CDP (KB Technologies Ltd.) IN FRESH WATER			
Property	Range of Values *		Test Method
	Time of Slurry Introduction	In Hole At Time Of Concreting	
Density (pcf)	Less than or equal to 67.0**	Less than or equal to 64.0**	Density Balance
Viscosity (sec/qt)	50 - 120	Less than or equal to 70	Marsh Cone
PH	6.0 – 11.5	6.0 – 11.5	pH paper pH meter

* At 20^o C
** Increase by two pounds per cubic foot in salt water

Notes: a. When the Contractor does not need to control the bottom hole conditions or when tests show that other criteria are appropriate, the Engineer may modify the values.

b. When the contract requires desanding, the sand content shall not exceed 0.5% percent (by volume) in the bore hole as resolved by the American Petroleum Institute sand content test.

c. Submit changes for acceptance in writing by the Engineer.

d. Increases in the viscosity of polymer slurry beyond the above acceptable ranges during drilling may be allowed by the Engineer. However, increases in the viscosity of the polymer slurry beyond the above acceptable ranges during concrete placement will not be allowed. Use of other polymer materials that increase the cohesion of the soil material, or other construction methods to reduce the slurry viscosity just prior to concrete placement may be considered in-lieu of increasing the viscosity of the slurry.

686
687
688
689
690
691
692

Before placing concrete in the shaft excavation, take slurry samples from the base of the shaft using a sampling tool. Extract slurry samples from the base of the shaft and at intervals not exceeding 10 feet up the shaft. Extract samples until two consecutive samples produce acceptable values for density, viscosity, pH, and sand content (within the values shown on Table 511-1 - Shore Pac GCV

693 (CETCO Drilling Products Group) IN FRESH WATER or 511-2 - SLURRYPRO
694 CDP (KB Technologies Ltd.) IN FRESH WATER).

695
696 Ensure that the bottom of the shaft does not accumulate heavily
697 contaminated slurry suspension. The heavily contaminated slurry suspension
698 could impair the free flow of concrete. When finding unacceptable slurry
699 samples, take actions necessary to bring the slurry as specified in the contract.
700 Do not pour the concrete until re-sampling and testing results produce
701 acceptable values.

702
703 Furnish the reports of tests required above to the Engineer on completion
704 of each drilled shaft. An authorized person of the Contractor shall sign the
705 reports.

706
707 During construction, maintain at the level of slurry not less than five feet
708 above the highest piezometric water pressure along the depth of a shaft.
709 When the slurry construction method fails, stop this method and propose an
710 alternate method for acceptance by the Engineer

711
712 The Contractor shall use and dispose of slurry in accordance with
713 applicable Federal, State, and County requirements.

714
715 **(L) Excavation Inspection.** Provide equipment for checking the
716 dimensions and alignment of each permanent shaft excavation. Determine the
717 dimensions and alignment according to the contract. Measure the final shaft
718 depths with a suitable weighted tape after final cleaning.

719
720 A minimum of 50% of the base of each shaft shall have less than 0.5 inch
721 of sediment at the time the concrete is placed. The maximum depth of sediment
722 or debris on the base of the shaft shall not exceed 1.5 inches. The Contractor
723 will measure the shaft cleanliness in the presence of the Engineer by methods
724 deemed appropriate to the Engineer.

725
726 Also, for dry excavations the maximum depth of water shall not exceed 3
727 inches before pouring the concrete.

728
729 **(M) Reinforcing Steel Cage Construction and Placement.** Assemble and
730 place the reinforcing steel cage immediately after the Engineer inspects and
731 accepts the shaft excavation before pouring the concrete. To prevent
732 deformation of the cage while lifting, brace the reinforcing steel cage until the
733 cage is set in it's final position. The reinforcing steel cage includes longitudinal
734 bars, ties, cage stiffener bars, spacers, centralizers, and other necessary
735 appurtenances to acceptably complete and place the cage.

736
737 Tie and support the reinforcing steel in the shaft so that the reinforcing
738 steel will remain within allowable tolerances given in Subsection 511.03(P) –
739 Construction Tolerances. Use the concrete spacers or other approved non-
740 corrosive spacing devices at sufficient intervals (near the bottom and at intervals
741 not exceeding 10 feet up the shaft) to ensure concentric spacing for the entire

742 cage length. Use minimum of four spacers, equally spaced around
743 circumference, at each vertical interval. The spacers shall be constructed of
744 accepted material equal in quality and durability to concrete specified for the
745 shaft, and shall be of adequate dimension to insure a minimum of four inches
746 annular space between the outer portion of the reinforcing steel cage and the
747 side of the excavated hole. Provide accepted cylindrical concrete bottom
748 supports to maintain the proper distance between bottom of the cage and base of
749 the shaft excavation.

750
751 Check the elevation of the top of the steel reinforcing cage and center of
752 cage location before, during and after pouring the concrete. When not
753 maintaining the rebar within the specified tolerances, make the corrections
754 needed to bring to within tolerances of the contract. Do not construct additional
755 shafts until after modifying the reinforcing steel cage support according to the
756 contract.

757
758 When the excavation at the bottom of the constructed shaft elevation is
759 lower than shown in the contract, extend at least half of the longitudinal bars
760 required in the upper portion of the shaft the additional length. Continue the tie
761 bars for the extra depth, spaced two-foot on center measured along the
762 circumference of the reinforcing steel cage. Extend the stiffener bars to the final
763 depth. These bars may be lap spliced or unspliced bars of the proper length.
764 The Engineer will not permit welding to the reinforcing steel. Unless the extra
765 depth of the drilled shaft is required due to modifications by the Engineer, the
766 additional reinforcing bars shall be at no additional cost to the State.

767
768 **(N) Crosshole Sonic Logging (CSL) Test Access Tubes.** Installation of
769 access tubes shall be in accordance with ASTM Standard Test Method for
770 Integrity Testing of Concrete Deep Foundations by Ultrasonic Crosshole Testing
771 Designation D 6760, except as modified herein. Install access tubes in all drilled
772 shafts to allow performance of CSL tests. Attach CSL access tubes securely to
773 the interior of the reinforcement cage as near to parallel as possible to the
774 vertical center axis of the drilled shaft in each drilled shaft and in the pattern
775 shown on the plans. Extend the access tubes from the bottom of the
776 reinforcement cage to at least 3.5 feet above the top of the shaft. The bottom of
777 the access tube shall be capped permanently. Joints required to achieve full
778 length of access tubes shall be watertight. Contractor shall take extra care to
779 prevent damaging the access tubes during reinforcement cage installation. Fill
780 the tubes with potable water to the top of the tubes as soon as the reinforcing
781 steel cage is installed. Check for leakage, misalignment, and damage before
782 placing concrete in the drilled shaft. Stop all leaks if present and repair any
783 damages or misalignment before placement of concrete starts. Check water
784 level as soon as possible after concrete placement (within 4 hours after concrete
785 placement) and fill with potable water if needed. Check water level in tubes
786 every day until CSL testing is completed. Top off tubes with potable water if
787 needed to prevent the debonding of the CSL tubes from the drilled shaft concrete
788 and thereby make any testing invalid. Keep the water level of the CSL tubes at
789 the top and under no circumstances shall the water level in the CSL tube go
790 below the concrete level. If leakage is detected after the pouring of the drilled

791 shaft concrete, monitor and top off the CSL tubes as often as needed to keep the
 792 water level in the tubes at the required level 24/7. Always reinstall the top
 793 watertight caps. Installation of CSL access tubes shall be incidental to the
 794 construction of the drilled shaft and shall be at no additional cost to the State.
 795

796 The completed drilled shaft foundations will be tested by crosshole sonic
 797 logging (CSL) after at least five days of curing time, but no later than 20 days
 798 after concreting. The CSL test will be performed by the Engineer. The
 799 Contractor shall assist in the testing by making all the shafts in the project
 800 accessible to the Engineer; provide electricity, lights and other needs whenever
 801 requested by the Engineer. Assistance by the Contractor shall be incidental to
 802 the construction of the drilled shaft and shall be at no additional cost to the State.
 803 The Contractor shall provide accurate data on the dates and time of concrete
 804 placement for each drilled shaft and the surveyed location of each tube. Also,
 805 provide the elevation of the concrete at the top of the drilled shaft. The Engineer
 806 will require a minimum of 20-working days after testing of any drilled shaft to
 807 accept or reject that shaft.
 808

809 The results of the CSL tests will be based on the percentage decrease in
 810 velocity as correlated to the following Concrete Condition Rating Criteria (CCRC),
 811 as shown in Table 511-3 – Concrete Condition Rating Criteria. Deviations from
 812 the following values shall be used for determining the Concrete Condition Rating.
 813

Table 511-3 Concrete Condition Rating Criteria			
Concrete Condition Rating	Rating Symbol	Velocity Reduction	Indicative Results
Good	G	0 – 10%	Acceptable concrete
Questionable	Q	10% - 25%	Minor concrete contamination or intrusion. Questionable quality concrete.
Poor	P/D	> 25%	Defects exist, possible water slurry contamination, soil intrusion, and or poor quality concrete.
Water	W	V=4760 – 5005 feet/sec	Water intrusion or water filled gravel intrusion with few or no fines present.
No Signal	NS	No signal received	Soil intrusion or other severe defect absorbed the signal, tube debonding if near top.

814

815 Shafts with test results other than "Good" will be tested in accordance with
816 Subsection 511.03(R), Integrity Testing.

817
818 After completion of the crosshole sonic logging tests and final acceptance
819 of the drilled shaft, all the access tubes shall be completely filled using a tremie
820 method of placement. Access tubes shall be free of debris and water before
821 filling with grout. Use non-shrink, non-metallic, grout of the same strength as the
822 drilled shaft concrete. Filling the access tubes shall be at no additional cost to
823 the State.

824
825 **(O) Concrete Placement.**

826
827 **(1) General.** Place the concrete through a concrete pump or other
828 means as accepted by the Engineer using accepted methods as
829 described below.

830
831 Concrete shall be placed in the shaft immediately after placing the
832 reinforcing steel.

833
834 Concrete placement for the load test drilled shaft shall be
835 continuous from the bottom to at least the top of shaft cutoff elevation and
836 until good quality concrete emerges above the top of the shaft cutoff
837 elevation. To ensure that the drilled shaft concrete is sound below the top
838 of shaft cutoff elevation, the trial and production drilled shafts shall be
839 poured four feet above the cutoff elevation and until good quality concrete
840 is evident four feet above top of shaft cutoff elevation. For the production
841 drilled shafts, the drilled shaft concrete four feet above the cutoff elevation
842 shall be removed no sooner than final set and 48 hours after the
843 completion of the production drilled shafts concrete pour. Final set shall
844 be when the concrete has reached a compressive strength of 1000 psi.
845 For the trial drilled shafts, the concrete four feet above the cutoff elevation
846 shall be removed after the coring is completed. Prior to removing the
847 concrete above the cutoff elevation, a circumferential diamond blade
848 sawcut 2½ inches deep shall be made at the cutoff elevation. Then the
849 portion of the drilled shaft more than one foot above the cutoff elevation
850 shall be removed with equipment no larger than a 90 pound pavement
851 breaker. Thereafter the remaining one foot of the drilled shaft above the
852 cutoff elevation shall be removed using jack hammers no heavier than 30
853 pounds for the upper nine inches and 15 pound maximum for the lowest
854 three inches.

855
856 A minimum of four and two, 6-inch by 12-inch concrete cylinders
857 shall be made for the compressive strength testing and unit weight testing,
858 respectively. Production shaft and trial shaft cylinders with compressive
859 strengths less than the minimum 28-day compression strength will be
860 considered defective. Production shafts and trial shaft with air-dry core
861 sample unit weight less than two pounds per cubic foot of the air-dry unit
862 weight test cylinders will be considered defective. Contractor shall submit

863 a corrective method plan for the defective shaft to the Engineer for review
864 and approval prior to their use.

865
866 The elapsed time from the beginning of concrete placement in the
867 shaft to the completion of the placement shall not exceed four hours.
868 Adjust admixtures accepted by the Engineer so that concrete remains in a
869 workable plastic state throughout 4-hour placement limit. A longer
870 placement time may be requested, and requests shall be submitted to the
871 Engineer for review and acceptance 30 days prior to the time the concrete
872 pour (with a longer placement time) is needed. Should the Contractor
873 exceed the 4-hour limit without obtaining prior acceptance by the
874 Engineer, the Contractor may be required to core the drilled shaft. These
875 drilled shaft corings shall be at no additional cost to the State and no
876 additional time will be granted.

877
878 Before placing the concrete, provide results of 3-day, 7-day, 14-day
879 and 28-day compressive strength tests of a trial mix and a slump loss test
880 at least 30 days prior to placement of concrete. Supply a concrete mix that
881 will maintain a slump of four inches or greater after four hours from initial
882 mixing. Conduct the trial mix and slump loss tests using concrete and
883 under ambient temperatures appropriate for the site conditions. The
884 ambient temperature used shall be the temperature at the elevation of
885 existing ground before any excavation started.

886
887 Drilled shaft mix design shall minimize segregation and bleeding.
888 The top surface of the drilled shafts shall be leveled, cleaned, and
889 roughened prior to concrete placement for the footing.

890
891 **(2) Monitoring Concrete Volume.** For each drilled shaft, prepare and
892 submit a monitoring record the next working day after concrete placement
893 has been completed. All monitoring shall be performed in the presence of
894 the Engineer or his representative. As a minimum, the monitoring record
895 shall consist of the following:

896
897 **(a)** A chart that is made up after drilled shaft excavation has
898 been completed and accepted by the Engineer and before concrete
899 placement has commenced. Indicated on the chart, depth of hole
900 plotted with theoretical volume of concrete to fill drilled shaft hole.
901 Plot concrete elevation (surface) along the vertical axis and
902 concrete volume along the horizontal axis.

903
904 **(b)** As concrete is being place, measure concrete surface at an
905 interval of approximately each cubic yard of concrete discharged.
906 Plot concrete volume actually placed at each elevation point. Use
907 this chart to determine if any necking down or enlargement of shaft
908 has occurred during concrete placement.

909
910 **(c)** Keep records of steel and concrete movement to document
911 the following conditions:

912
913
914
915
916
917
918
919
920
921
922
923
924
925
926
927
928
929
930
931
932
933
934
935
936
937
938
939
940
941
942
943
944
945
946
947
948
949
950
951
952
953
954
955
956
957
958

(1) When removing temporary or permanent casing, elevation of the top of reinforcing cage shall not rise more than 2 inches from its original elevation;

(2) As temporary casing is extracted, static level of fluid concrete shall not rise.

(3) Concreting by Pump. Concrete pumps and discharge lines for concrete placement in wet or dry excavations shall be used. Pumps and pump lines used to place concrete shall be of sufficient length, weight, and diameter to discharge concrete at the shaft base elevation. The pump and pump lines that will come in contact with concrete shall not contain aluminum parts. Discharge line shall have a minimum diameter of 4 inches and watertight joints. Concrete placement shall not begin until the pump line discharge orifice is at the shaft base elevation.

For wet excavations, use a plug to separate the concrete from the fluid in the hole until pumping begins. Remove the plug from the excavation or use plugs, made from a material accepted by the Engineer that will not cause a defect, if not removed.

The discharge orifice shall remain at least five feet below the surface of the fluid concrete. When lifting the pump line during concreting, reduce the line pressure temporarily until the orifice at a higher level in the excavation has been repositioned.

Upon removal of the pumpline orifice from the fluid concrete column and/or discharging concrete above the rising concrete level during the concrete pour, the Engineer will consider the shaft defective. In such a case, remove the reinforcing cage and concrete, the necessary sidewall removal specified by the Engineer, and repour the shaft. Costs of replacement of defective shafts shall be at no costs to the State and no additional time will be granted.

(P) Construction Tolerances. The following construction tolerances apply to drilled shafts:

(1) The center of the drilled shaft concrete and reinforcing bars shall be within 1/12 of the shaft diameter or 3 inches, whichever is less, in the horizontal plane at the plan elevation for the top of the shaft.

(2) The vertical alignment of the shaft excavation shall not vary from the plan alignment by more than 0.25 inch per foot of depth. The alignment of a battered shaft excavation shall not vary by more than 0.5 inch per foot of depth from the prescribed batter.

959 (3) After placing the concrete, the top of the reinforcing steel cage shall
960 be no more than 6.0 inches above and no more than 3.0 inches below
961 plan position.
962

963 (4) The cutoff (top) elevation of the shaft shall have a tolerance of ± 0.5
964 inch from the plan top of shaft elevation.
965

966 (5) The dimensions of casing are subject to American Pipe Institute
967 tolerances applicable to regular steel pipe.
968

969 (6) Design the excavation equipment and methods so that the
970 completed shaft excavation will have a flat bottom. The cutting edges of
971 excavation equipment shall be normal to the vertical axis of the equipment
972 within a tolerance of $\pm 3/8$ inch per foot of diameter.
973

974 (7) Casing diameters shown in the contract documents to outside
975 diameter (OD) dimensions. When accepted by the Engineer, a casing
976 larger in diameter than shown in the contract documents may be provided
977 to facilitate meeting this requirement. When using a series of telescoping
978 casings, size casing to maintain shaft diameters.
979

980 Drilled shaft excavations that cannot be completed within the required
981 tolerances are unacceptable. When accepted by the Engineer, corrections may
982 be made to an unacceptable drilled shaft excavation by accepted combination of
983 the following methods:
984

985 (1) Overdrill the shaft excavation to a larger diameter to permit
986 accurate placement of the reinforcing steel cage with the required
987 minimum concrete cover.
988

989 (2) Increase the number, size, or length of the reinforcing steel.
990

991 (3) Redesign the foundation.
992

993 (4) Other methods accepted by the Engineer.
994

995 The acceptance of correction procedures is dependent on analysis
996 of the effect of the degree of misalignment and improper positioning. The
997 Contractor is solely responsible to submit remedial repair procedures that
998 shall make the structure equal to or better than the original design. The
999 Engineer will solely determine if the remedial repair meets the
1000 requirements and is acceptable. A Hawaii Licensed Professional
1001 Structural Engineer and a Hawaii Licensed Professional Civil Engineer
1002 who specializes in Geotechnical Engineering shall stamp and sign the
1003 redesign drawings and computations. Correct out of tolerance drilled shaft
1004 excavations including engineering analysis and redesign at no cost to the
1005 State. No time extension will be granted for any impact to the critical path
1006 due to the Contractor's incorrect installation of the drilled shaft.
1007

1008 **(Q) As-Built Drilled Shaft Location.** The Contractor shall provide survey
1009 ties to all as-built location of all drilled shafts.

1010
1011 The Contractor shall notify the Engineer prior to performing the survey
1012 work and the Contractor shall survey the drilled shafts under the supervision of
1013 the Engineer or the Engineer's representative. A copy of the survey notes and
1014 the scaled plan locating all the completed drilled shafts in a given footing shall be
1015 submitted to the Engineer for review and approval. Submit accepted copy of the
1016 survey notes and the scaled plan as an electronic file, the Engineer will
1017 determine the acceptable format and media.

1018
1019 No form work for any footing shall proceed until the drilled shafts are found
1020 acceptable by the Engineer.

1021
1022 **(R) Integrity Testing.** Drilled shafts shall be visually inspected and tested
1023 for density, strength and soundness. Integrity testing will be performed on drilled
1024 shafts as determined by the Engineer. Integrity testing shall consist of partial or
1025 full depth concrete coring at drilled shafts determined by the Engineer. Coring
1026 shall be performed by the Contractor at the locations designated by the Engineer
1027 in the presence of the Engineer. The Engineer will solely determine if the cored
1028 shaft is acceptable or defective. Defective shafts shall be replaced and drawings
1029 and computations stamped and signed by a Hawaii Licensed Professional
1030 Engineer in the Structural Branch and Civil Branch (specializing in the
1031 Geotechnical field) shall be submitted for acceptance by the Engineer. The
1032 Contractor shall core vertical holes at locations and depths determined by the
1033 Engineer. The number of core holes to be done shall be determined by the
1034 Engineer. The core hole shall be accepted by the Engineer. The recovered core
1035 samples shall have a minimum diameter of 3.3 inches or 3 times the nominal
1036 maximum aggregate size of the concrete mix, use whichever is larger.

1037
1038 The measured unit weight of the air dry core samples shall not be less
1039 than two pounds per cubic foot of the air dry unit weight test cylinders.

1040
1041 Provide concrete cores properly marked in a core box with labels of the
1042 drilled depth at each interval of core recovery to the Engineer for evaluation and
1043 testing. The Engineer will be allowed a minimum of 7 working days for
1044 evaluation and testing of the core samples. The cored holes shall be filled with
1045 prepackaged, non-shrink, non-metallic, grout of the same minimum strength as
1046 the drilled shaft.

1047
1048 Cost of coring performed on acceptable production drilled shafts with no
1049 defects will be borne by the State. Cost of full depth coring of trial shaft shall be
1050 borne by the Contractor. Cost of coring performed on any drilled shaft that has
1051 defects shall be borne by the Contractor. If the drilled shaft in question is on the
1052 critical path, a time extension and the linear foot payment for coring will be the
1053 sole remedy given if the drilled shaft has no defects. The delay will be calculated
1054 from the end of the 20 working days review period of the cores to when the last
1055 core was taken. Contractor shall submit a corrective methods plan for the
1056 defective shafts to the Engineer for review and approval prior to their use. The
1057 corrective methods plan shall restore the defective drilled shaft to a condition

1058 equal or better that of a drilled shaft that had no defects. Do not begin repair
1059 operations until receiving the Engineer's acceptance of the corrective methods
1060 plan for that defective drilled shaft.
1061

1062 **511.04 Measurement.**

1063
1064 (A) Furnishing drilled shaft drilling equipment and furnishing instrumentation
1065 and collecting data will be paid on a lump sum basis. Measurement for payment
1066 will not apply.
1067

1068 (B) The Engineer will measure obstruction per hour in accordance with the
1069 contract documents. Once the Engineer authorizes compensation for obstruction
1070 removal, duration of obstruction removal, including time required for obstruction
1071 disposal, will be measured for payment. Depth of obstruction removed will be
1072 subtracted from total depth measured for payment under other applicable drilled
1073 shaft excavation pay items.
1074

1075 (C) The Engineer will measure load test per each in accordance with the
1076 contract documents.
1077

1078 (D) The Engineer will measure trial shaft holes per linear foot. The Engineer
1079 will compute length between existing ground surface elevation at trial shaft hole
1080 center, before drilling, and authorized bottom elevation of hole.
1081

1082 (E) The Engineer will measure unclassified shaft excavation per linear foot,
1083 along shaft centerline, including bells. The Engineer will compute length
1084 between plan top of shaft elevation to plan estimated tip elevation.
1085

1086 (F) The Engineer will measure drilled shaft per linear foot. The Engineer will
1087 compute length between plan top of shaft elevation and to plan estimated tip
1088 elevation.
1089

1090 (G) The Engineer will measure coring for integrity testing per linear foot. The
1091 Engineer will compute length between the bottom of coring elevation and the top
1092 of the shaft concrete elevation.
1093

1094 **511.05 Payment.** The Engineer will pay for the accepted pay items listed below at
1095 the contract price per pay unit, as shown in the proposal schedule. Payment will be full
1096 compensation for the work prescribed in this section and the contract documents.
1097

1098 The Engineer will pay for each of the following pay items when included in the
1099 proposal schedule.
1100

1101 Pay Item	1102 Pay Unit
1103 Furnishing Drilled Shaft Drilling Equipment	1104 Lump Sum

1105 The Engineer will pay for:
1106

1107 (A) 60 percent of the contract bid price when drilling equipment is on job site,
1108 assembled, and ready to drill foundation shafts.
1109
1110 (B) 40 percent of the contract bid price upon completion of drilling shafts, and
1111 placing shaft concrete up to top of shafts.
1112
1113 Obstructions Hour
1114
1115 The Engineer will pay for:
1116
1117 (A) 80 percent of the contract bid price upon completion of removing the
1118 obstruction.
1119
1120 (B) 20 percent of the contract bid price upon removing and disposing of the
1121 obstruction.
1122
1123 The maximum payment per designated obstruction shall not exceed 20
1124 times the unit cost for unclassified excavation.
1125
1126 Load Test at _____ Each
1127
1128 The Engineer will pay for:
1129
1130 (A) 100 percent of the contract bid price upon completion of bi-directional load
1131 test shaft installation/construction, caliper and load testing with reports, and other
1132 related costs to the performance of the load test.
1133
1134 Trial Shaft at _____ Linear Foot
1135
1136 The Engineer will pay for:
1137
1138 (A) 60 percent of the contract bid price upon completion of excavation trial
1139 shaft holes through to bottom of shaft elevation or as authorized by the Engineer
1140 and providing inspection facilities.
1141
1142 (B) 20 percent of the contract bid price upon completion of coring and
1143 backfilling holes..
1144
1145 (C) 20 percent of the contract bid price upon completion of CSL testing and
1146 restoring the site.
1147
1148 The Engineer will not pay for trial shaft holes that the Contractor failed to
1149 demonstrate to the Engineer the adequacy of its proposed methods and
1150 equipment.
1151
1152 Unclassified Shaft Excavation at _____ Linear Foot
1153
1154 The Engineer will pay for:
1155

1156 (A) 60 percent of the contract bid price upon completion of using drilling
1157 equipment, using special tools and drilling equipment to excavated shaft.

1158
1159 (B) 20 percent of the contract bid price upon completion of furnishing and
1160 installing temporary casing.

1161
1162 (C) 20 percent of the contract bid price upon completion of removing and
1163 disposing of excavated material.

1164
1165 Drilled Shaft at _____ Linear Foot

1166
1167 The Engineer will pay for:

1168
1169 (A) 60 percent of the contract bid price upon completion of drilling.

1170
1171 (B) 15 percent of the contract bid price upon completion of furnishing,
1172 assembling, and placing steel cage.

1173
1174 (C) 15 percent of the contract bid price upon completion of furnishing and
1175 placing concrete.

1176
1177 (D) 10 percent of the contract bid price upon completion of removing and
1178 disposing of excavated material.

1179
1180 Coring for Integrity Testing for acceptable drilled shaft. Linear Foot

1181
1182 The Engineer will pay for:

1183
1184 (A) 70 percent of the contract bid price upon completion of concrete coring.

1185
1186 (B) 20 percent of the contract bid price upon completion of filling cored holes
1187 with non-shrink grout of the same minimum strength as drilled shaft.

1188
1189 (C) 10 percent of the contract bid price upon completion of packaging the core
1190 samples and delivering them to the Engineer.”

1191
1192
1193 **END OF SECTION 511**

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47

Make the following Section a part of the Standard Specifications:

"SECTION 540 – VERY EARLY STRENGTH LATEX MODIFIED CONCRETE (VESLMC)

540.01 Description. The work in this section describes the construction of very early strength latex modified concrete (VESLMC) for bridge deck closure pour and end beam closure pours.

Related works for the VESLMC are applicable and specified in Section 411.03 (N) - Surface Test, Section 503 - Concrete Structures, Section 601 - Structural Concrete, and Section 602 - Reinforcing Steel.

540.02 Materials.

(A) VESLMC. Use very early strength latex modified concrete (VESLMC) with fibers which provides a low color contrast with the surrounding deck surfaces. The nominal maximum size of coarse aggregate shall be 3/8 inch. The Engineer may accept an alternative concrete that is equal or better in performance, when compared to the characteristics and requirements of the VESLMC stated herein.

(1) The VESLMC shall use cement which is a finished calcium – sulfo-aluminate that contains no more than 2 percent C3A and not greater than 0.03 percent shrinkage in accordance with ASTM C 157 for hardened-cement mortar based on air storage at relative humidity of 50 +/- 4 percent and at a temperature of 73 +/- 3 deg F. The amount of cement in the VESLMC shall not exceed 750 lbs/cy.

(2) The VESLMC shall include a modified styrene butadiene copolymer latex that meets the requirements of FHWA Research Report RD-78-35, except for curing or an accepted equal.

(3) The VESLMC shall include 1 ¼ inch length alkali-resistant (AR) glass fiber at 6 lbs/cy or approved equal.

(4) Corrosion Inhibitor in the VESLMC shall be migrating amine carboxylate. Use a minimum of 24 ounces per cubic yard or as recommended by the manufacturer.

(5) The VESLMC shall also meet the following requirements:

Characteristics	Requirements	Test Methods
Minimum Compressive Strength: At 3 hours At 28 days	3000 psi 6000 psi	ASTM C1074 ASTM C39
Bond and Tensile Strength	250 psi	ASTM C1583
Ring Test	No cracking at age less than 28 days	ASTM C 1581
Rapid Chloride Permeability Test	Charge passed less than 150 coulombs @ 63 days	ASTM C1202

48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81

(a) Provide certified test data from the concrete manufacturer and cement manufacturer that the concrete complies with these requirements. Perform the material sampling and testing in the presence of the Engineer or as acceptable to the Engineer. Certification shall be submitted prior to the placement of the VESLMC.

(b) In addition to the aforementioned requirements, use ASTM C1074 to provide test results of three cylinder and provide a strength-maturity relationship for each 3, 4, 6, and 12 hour test ages from trial batches of the proposed concrete.

(c) VESLMC shall provide the minimum bond requirement of 250 psi to all concrete including itself.

(B) Other Materials.

- (1) Fine Aggregate for Concrete 703.01
- (2) Coarse Aggregate for Portland Cement Concrete 703.02
- (3) Admixtures 711.03
- (4) Water 712.01
- (5) Reinforcing Steel including GFRP bars 602

540.03 Construction Requirements. Conform to the requirements of Section 503 Concrete Structures and as required in these specifications.

(A) Submittal Requirements. Prior to the start of this work, provide six copies of the following submittals in one complete set for acceptance. Indicate

82 clearly the name of the product and its manufacturer on pertinent submittals.
83 No work that is related to these submittals shall be performed until written
84 acceptance has been received.

85
86 (1) Certifications, test data and assurances.

87
88 (2) Information on the concrete including shelf life, working times,
89 and placement rates.

90
91 (3) Detailed information on all equipment and materials that will be
92 used for all aspects of the work including but not limited to determining
93 surface profiles and compressive strengths, quality control (QC) plan,
94 placing (handling, mixing, consolidating, finishing, curing, and texturing)
95 of concrete, and testing for delaminations. If equipment includes use of
96 a continuous volumetric concrete mixer, provide the documentation
97 required under Section 540.03(C) Continuous Volumetric Concrete
98 Mixers herein.

99
100 (4) Detailed step by step procedures for all aspects of the work
101 including determining surface profiles and compressive strengths,
102 cleaning and roughening substrata, placement (handling, mixing,
103 consolidating, finishing, curing, and texturing) of concrete, and testing
104 for delaminations.

105
106 (5) Detailed plans and procedures to be in compliance with the
107 requirements of Section 107 Legal Relations and Responsibility to
108 Public including complying to noise variances, and controlling of work to
109 appropriately minimize dust and air borne debris from cleaning and
110 roughening the substrata, mixing and placing concrete, and cleaning
111 operations, and to prevent water runoffs.

112
113 (6) Planned actions to maintain adherence to limitations and
114 requirements of the following variables with regards to concrete work:

115
116 (a) Evaporation rate as determined from ACI 305 Hot Weather
117 Concreting

118
119 (b) Rain

120
121 (c) Equipment and traffic control near or on work areas during
122 placement and curing operations

123
124 (7) Test reports of compressive strengths, bond strengths, and
125 maturity readings during the progress of the work.

126
127 **(B) Early Strength Monitoring.** Provide a minimum of two sacrificial sensor
128 type maturity meters meeting the requirements of ASTM C1074 to determine

129 concrete conformance to early strength requirements. The maturity meters
130 shall have a secure and unalterable means of collecting data.

131 Verify the calibration of the maturity meters in the presence of the Engineer
132 prior to use on the project by placing a temperature sensor in a controlled
133 temperature water bath and recording whether the indicated temperature
134 agrees with the known temperature of the water bath. Perform temperature
135 comparison test at approximately 5 different temperatures, 75°F, 100°F, 125°F,
136 150°F and 175°F. The temperature recording device shall be accurate to within
137 $\pm 2^\circ\text{F}$.

138
139 Develop strength-maturity relationship using only maturity meters, materials
140 and conditions to be used or encountered on the project for VESLMC prior to
141 placing any VESLMC on the project. Notify the Engineer when the
142 development of the maturity curve will be done and conduct all tests in the
143 presence of the Engineer in accordance with ASTM C 1074 Estimating
144 Concrete Strength by the Maturity Method at the VESLMC producer's
145 laboratory or other approved laboratory facilities. The material testing
146 laboratory shall be accredited in all the test methods used. The technicians
147 doing the sampling and testing shall be certified in all the test methods being
148 performed. For every VESLMC design, prepare a minimum size of each batch
149 of VESLMC of at least one cubic yard and cast a minimum of 15 cylinders in
150 accordance with AASHTO T23. Test three cylinders at ages of 3, 4, 6, 12, and
151 24 hours. Submit all results and curves to the Engineer for review and
152 acceptance.

153
154 Any alterations in mix proportions or material source or type of material, in
155 excess of those tolerable by batching variability, requires the development of a
156 new strength-maturity relationship prior to use. This includes a change in
157 material type, source, or proportion of cement, fly ash, coarse aggregate, fine
158 aggregate, fibers or admixtures. The Engineer will require the development of a
159 new strength-maturity relationship for any changes in the water to cement ratio
160 of greater than 0.02.

161
162 Submit the following information of the strength-maturity relationship prior to
163 placing any VESLMC on the project.

- 164
165 (1) Project number, VESLMC mix number and test date.
166
167 (2) Air content, slump and total free water of the batch of VESLMC.
168
169 (3) Type and amount of admixtures used in the batch of VESLMC.
170
171 (4) Strength of each specimen and average strength of specimens at
172 each test age.
173
174 (5) Maturity index for each instrumented test specimen and the

175 average maturity index for the instrumented specimens at each
176 test age.

- 177
178 (6) Graphs of the average compressive strength verses the average
179 value of the maturity index as described in the strength-maturity
180 relationship of ASTM C 1074.

181
182 Provide a minimum of two maturity meters at the project site for monitoring the
183 early strength of VESLMC during each section of VESLMC placement. Assure
184 that the batteries for the maturity meters are adequately charged prior to use.
185 Use the same brand and type of maturity meters and thermocouple sensors as
186 those used to develop and verify the strength-maturity relationship.

187
188 Install at least two maturity meter sensors per VESLMC placement such that
189 there is a minimum of one sensor in each half of the length of the deck slab to
190 be poured. Place sensors no closer than 4 inches from any formed surface or
191 edge of slab being placed. Modify means and methods subsequent to failures
192 of sensors to prevent any reoccurrence. The Engineer may designate location
193 of maturity meter sensors.

194
195 Conduct a validation test after each day of VESLMC placement by comparing
196 an average compressive strength of three cylinders to the compressive
197 strength as determined in the accepted strength-maturity relationship to verify
198 that the in-place VESLMC compressive strengths are accurately represented.
199 Submit the validation data with the same extent of information as the initial
200 strength-maturity relationship submittal. The Engineer will consider the
201 strength-maturity relationship valid for the predicted strengths within 5 percent
202 of the actual compressive strength. Make a mathematical adjustment to the
203 strength-maturity relationship when the actual average compressive strength
204 for three validation tests are 5 to 10 percent above or below the predicted
205 compressive strength as directed by the Engineer. Develop a new strength-
206 maturity relationship when the actual average compressive strength for three
207 validation tests exceeds 10 percent above or below the predicted compressive
208 strengths.

209
210 The Engineer will not accept VESLMC which does not meet the compressive
211 VESLMC strength of 3,000 pounds per square inch within 3 hours as
212 determined by the maturity meter readings. No waiver to this requirement will
213 be granted by the Engineer or shall it be requested for by the Contractor.

214
215 **(C) Continuous Volumetric Concrete Mixers.** The Engineer will allow
216 the use of continuous volumetric concrete mixers. Use standard manufactured
217 continuous volumetric concrete mixers that are capable of combining
218 aggregate, cement, water, fibers, and admixtures into a uniform mixture within
219 the specified mixing time and comply with ASTM C 685. The volumetric
220 continuous concrete mixers shall also conform to the following requirements:

222
223
224
225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268

- (1) Proportion cement, aggregate, water and admixture by volume.
- (2) Carry each ingredient in separate compartments and produce a minimum of 6 cubic yards of concrete.
- (3) Measure the cement as it is introduced into the mixture with a recording meter.
- (4) Control the flow of water and admixtures as they are introduced into the mixture with calibrated and adjustable flow control valves.
- (5) Indicate the number of gallons used to the nearest 0.10 gallons with a water flow control meter.
- (6) Proportion and blend all components of the concrete mixture on a continuous or intermittent basis via automatic calibration.

Calibrate and perform uniformity checks in accordance with ASTM C 685 and manufacturer's recommendations to ensure proper proportioning and consistency of concrete. Provide the Engineer with the means to verify the calibration of the mixer and uniformity of the mix. Submit mixer calibration and uniformity reports and equipment specifications for review and approval. Do not use the continuous volumetric concrete mixer until the submittals are approved by the Engineer.

(D) Just -In-Time Training. JITT shall be held and shall conform to Section 695 – Just IN TIME TRAINING.

(E) Pre-Operational Conference. Schedule a meeting with the Contractor, and suppliers representatives involved in construction operation of the VESLMC and the Engineer, at a mutually agreed time, to discuss and verify the methods of accomplishing all phases of the VESLMC operations, contingency planning, and standards of workmanship for the completed items of work. Include the Contractor's superintendents, foremen, subcontractors, and supplier's technical representatives, and all key personnel involved with the VESLMC work as attendees of the pre-operation conference. Do not begin placement of VESLMC before the Engineer accepts the pre-operational conference as completed.

(F) Authorization to Work. Proceed with the work within the project limits when the following items have met the requirements and are accepted by the Engineer in writing.

- (1) Subsection 540.03(A) Submittal Requirements.
- (2) Subsection 540.03(B) Early Strength Monitoring.

269
270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
292
293
294
295
296
297
298
299
300
301
302
303
304
305
306
307
308
309
310
311
312
313
314
315

- (3) Subsection 540.03(C) Continuous Volumetric Concrete Mixers.
- (4) Subsection 540.03(D) Just-In-Time Training.
- (5) Subsection 540.03(E) Pre-Operational Conference.

(G) Preparation of Substrate. Use the procedures of ICRI (International Concrete Repair Institute) Guideline No. 03730 "Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcement Steel Corrosion", ICRI Guideline 03732 "Selecting and Specifying Concrete Surface, Surface Preparation for Sealers, Coatings and Polymer Overlays" sections of ACI 546.1R-80 (Reapproved 1997) "Guide for Repair of Concrete Bridge Superstructures". The Contractor shall be responsible for any falsework requirements, debris, noise and pollution control on and below the repair area. Prepare the repair areas as follows:

(1) Removing Material:

- (a) Protect surfaces outside the placement areas from damage during concrete removal operations.
- (b) Following the AC removal operation, remove unsound concrete from the deck surface. Hydrodemolition, pneumatic tools weighing less than 15 pounds, or approved equal maybe used. Special care shall be taken to ensure compliance with Section 540.03(A) Submittal Requirements and especially 540.03(A)(5). Produce a minimum profile of the substrate surface which meets International Concrete Repair Institute (ICRI) concrete surface profile (CSP) 7 or a minimum roughness of approximately one-fourth inch amplitude. Demonstrate roughness by comparing the ICRI Concrete Surface Profile chip set to the prepared surface. Produce a minimum macrotexture depth of 0.08 inch as determined according to ASTM E965 Measuring Surface Macrotexture Depth using a Volumetric Technique. Perform surface macrotexture depth tests in the presence of the Engineer. Perform a minimum of one macrotexture depth test every fifty feet or fraction thereof of longitudinal distance.

(2) Preparation. Prepare the concrete substrate and any reinforcing steel in the area by removing any contaminants, dust, loose concrete and mortar that may affect bonding of the VESLMC. Remove debris, wash water and waste material using vacuum machines and properly dispose outside the project limits at a disposal site accepted by the Engineer. Brooms shall not be used on the prepared surface for cleaning. The repair area shall be free of dust, dirt, oil, grease and other contaminants that may affect bonding of the VESLMC. The Contractor

316
317
318
319
320
321
322
323
324
325
326
327
328
329
330
331
332
333
334
335
336
337
338
339
340
341
342
343
344
345
346
347
348
349
350
351
352
353
354
355
356
357
358
359
360
361
362

shall protect the public from dust pollution and other damages resulting from the preparation of the construction area. The Contractor shall prevent abrasives and debris from entering drainage systems and streams.

(H) Traffic and Equipment Control on Bridge.

(1) Construction vehicles shall not exceed a 5-mph speed limit within the placement area in both directions during VESLMC placement and curing.

(2) Equipment and vehicles shall not contaminate the prepared deck surface.

(3) The Contractor shall not permit compressors or other equipment that produce vibrations on the span undergoing deck VESLMC work. Equipment shall not be located on spans undergoing deck VESLMC unless approved by the Engineer.

(4) Vehicular traffic shall not exceed a 15-mph speed limit on the bridge span during VESLMC pour and cure.

(5) The VESLMC shall have a minimum compressive strength of 3000 psi as determined by Early Strength Monitoring and by testing according to manufacturer's recommendations prior to opening to traffic.

(6) The bridge deck shall not be used as a storage area for equipment or for stockpiling materials. Loads exceeding eight tons shall not be used on the bridge unless approved by the Engineer.

(I) Placement of VESLMC.

(1) The concrete manufacturer's and cement manufacturer's technical representatives shall be present during initial work and as requested by the Engineer at no increase in contract time or contract price.

(2) A technical representative shall be capable and knowledgeable about the product he represents, e.g., know under what conditions the product should be placed for optimal results, know what causes defects or problems, and know how to troubleshoot the product. These are topics that should be discussed in the JITT.

(3) A technical representative shall provide aid and field supervision to assure that the work is properly installed and performed as recommended by the manufacturer and accepted by the Engineer at no increase in contract time or contract price.

363
364
365
366
367
368
369
370
371
372
373
374
375
376
377
378
379
380
381
382
383
384
385
386
387
388
389
390
391
392
393
394
395
396
397
398
399
400
401
402
403
404
405
406
407
408
409

(4) The Contractor shall adhere to recommendations made by the technical representative and accepted by the Engineer at no increase in contract time or contract price.

(5) Place the VESLMC according to the concrete manufacturer's and cement manufacturer's recommendations and instructions and as accepted by the Engineer. The Contractor shall inform the Engineer in writing of any work that is not in conformance with the manufacturer's recommendation.

(6) A bonding agent recommended by the cement manufacturer may be used where concrete is placed against existing concrete. Use bonding agent in accordance with the manufacturer's recommendations.

(7) Unless otherwise directed by the manufacturer, maintain the interface surface wet for a minimum of 1 hour prior to placement and remove all excess surface moisture using oil free compressed air just prior to placing the concrete.

(8) Any falsework and formwork required shall be considered incidental to this work.

(9) Concrete shall be mixed as recommended in writing by the manufacturer.

(J) Consolidation. Consolidate the concrete as recommended by the manufacturer.

(K) Finishing. Finish while the concrete is plastic and workable. Position float parallel to road centerline and finish in the transverse direction passing gradually from one side of the pavement to the other. Move ahead along pavement centerline advancing not more than one-half of float length. Finish the concrete to meet the requirements of the Surface Testing subsection. Texture surface of the concrete by longitudinal tining 1/8" wide uniformly spaced at 3/4-inch on center and 1/8" deep.

For each day of production, complete one bond test for every 1000 square feet or fraction thereof of VESLMC area, but no less than one per day.

(L) Protection and Curing. Protect freshly placed concrete from plastic shrinkage, premature drying, excessive hot temperatures and direct wind. See Section 540.03(A) Submittal Requirements for submittal requirements. Cure the concrete as recommended by the concrete, cement, and curing manufacturers.

(M) Construction Joints. Use construction joints only with the acceptance

410
411
412
413
414
415
416
417
418
419
420
421
422
423
424
425
426
427
428
429
430
431
432
433
434
435
436
437
438
439
440
441
442
443
444
445
446
447
448
449
450
451
452
453
454
455
456

of the Engineer and in accordance with the Contract.

(N) Surface Testing. The finished surface shall conform to the following requirements when tested by the Contractor in the presence of the Engineer within 14 days following the placement of concrete:

(1) Surface Flatness. The surface shall not vary more than 1/8 inch under a 10-foot straightedge placed parallel to the traffic lanes.

(2) Surface Condition. The surface shall be sound and free from cracks greater than 0.01 inch in width.

(O) Quality Control (QC):

(1) Plastic Concrete Sampling and Testing. Perform QC concrete sampling and testing in accordance with the QC plan and following requirements:

(a) QC tests shall include air content, temperature, slump and preparing compressive strength cylinders for testing at later dates. Perform plastic concrete tests on the initial delivery for each concrete design mix each day. Ensure that QC technicians and laboratory are qualified in accordance with the HDOT's Quality Assurance Manual for Materials dated October 2001. Ensure one technician is present and performing test throughout the placement operation at each placement site. If any QC plastic properties fail, with no exceptions, reject the mixer until recalibrated, terminate the LOT and notify the Engineer. A LOT shall be one day's production, once every maximum of 20 cubic yards of concrete, or approximately once every 1000 square feet of area, whichever is least. Cast a set of cylinders representing the LOT of concrete from the same sample of concrete.

(b) Following the termination of a LOT, obtain samples from a new load and perform plastic properties tests until such time as water to cementitious material ratio, air content, temperature and slump comply with project requirements. Initiate a new LOT once the testing indicates compliance.

(c) Maintain a logbook with records of relevant details of all tests. Provide a copy of new entries at the end of each work day. Make available for inspection by the Engineer during the normal working hours of construction. At the end of the project, deliver the original logbook to the Engineer. The original logbook will become property of the Engineer.

(P) Verification and Independent Assurance. HDOT may perform

457
458
459
460
461
462
463
464
465
466
467
468
469
470
471
472
473
474
475
476
477
478
479
480
481
482
483
484
485
486
487
488
489
490
491
492
493
494
495
496
497
498
499
500
501
502
503

Verification sampling and testing for its own use for internal assurance and acceptance testing. Furnish sufficient concrete of each design mix for verification and independent assurance sampling and testing as required by the Engineer. When the Engineer performs verification, the Contractor may perform the same tests on the concrete at the same time. HDOT's Independent Assurance Program will be conducted to evaluate all sampling and testing used in the acceptance material.

(Q) Acceptance.

(1) Sampling and Testing. Sample and test concrete of each mix design for water to cementitious material ratio, air content, temperature, slump and cast a set of three cylinders for compressive strength once per LOT. A LOT shall be one day's production, once every maximum of 20 cubic yards of concrete, or approximately once every 1000 square feet of area, whichever is least. When more than one production facility or continuous volumetric mixers is used for the same mix design, apply the sampling and testing frequency per production facility or per continuous volumetric mixer.

Take these acceptance samples randomly in accordance with ASTM D 3665 or as determined by a random number table acceptable to the Engineer. Select and document the selection of random sample(s) prior to the work activity. Include the date and time of determination of the selection.

Provide curing facilities that have the capacity to store cylinder samples for QC and Verification, and Independent Assurance simultaneously for initial curing. Deliver the QC samples to the final curing facility in accordance with AASHTO T 23. At the same time, the Engineer will deliver verification and independent assurance samples to their final curing facility. All cylinders shall be clearly identified.

Test the QC laboratory cured samples for compressive strength at the age of 28 days in a laboratory meeting and maintaining at all times the qualification requirements in the Highways Division's Quality Assurance Manual for Materials and is an accredited material testing laboratory in the test method being performed. Notify the Engineer of the Quality Control Laboratory compressive test results within 24 hours.

The Engineer will average the QC compressive strengths data, average the Verification compressive strength data and compare the results. Comparison of results can also be on the latest five Verification data and the QC data during the same period. Based on this comparison, the Engineer will determine if the Validation Criteria as shown in the following table has been met.

Validation Criteria	
Range of Average Compressive Strength	QC and Verification Difference
Less than 3500 psi	450 psi
3,501 – 4,500 psi	590 psi
4,501 – 6,500 psi	910 psi
6,501 – 8500 psi	1,275 psi
Greater than 8,500 psi	1,360 psi

504
505
506
507
508
509
510
511
512
513
514
515
516
517
518
519
520
521
522
523
524
525
526
527
528
529
530
531
532
533
534
535
536
537
538
539
540
541
542

When the difference between the QC and Verification are less than or equal to the Validation Criteria, the QC data is validated and the Engineer will use the Contractor’s data as a part of the acceptance procedures. When the difference between QC and Verification data exceeds the Validation Criteria, the Engineer will initiate the dispute resolution process requirements of Section V of Highway’s Quality Assurance Manual for Materials.

(2) Hardened Concrete. Hardened concrete will be accepted or rejected on the basis of strength tests and any of the requirements or characteristics in Subsection 540.02 Materials. Do not discard a cylinder strength test result based on a low strength (strength below the specified minimum strength). Full payment will be made only for acceptable LOTS of concrete. The compressive strength of the LOT shall meet the specified minimum strength of 6000 psi at 28 days. The Engineer may accept the average compressive strength of three individual test results in lieu of individual strength test results provided that no single test result is less than 90 percent of the average value. The concrete shall also meet the specified minimum compressive strength of 3000 psi within 3 hours as determined by the maturity meter index correlation.

(3) Bond Strengths. Bond strengths shall be determined in accordance with the manufacturer’s recommendations. The Engineer may allow for a sample slab to be tested in lieu of the existing substrate.

The bond strengths shall be 250 psi at 24 hours. If bond strengths are less than 250 psi due to failure in the substrate than the Engineer will determine if the bond is acceptable.

The Engineer may accept the average of 3 individual test results for that LOT in lieu of individual test readings, provided that no single test value is less than 90% of the average value.

(R) Post-Construction Survey, Sealing Cracks and Repairing Delaminations. Perform a post-construction survey with the Engineer present between three and nine months after VESLMC placement. Contractor shall survey all VESLMC repairs in accordance with ASTM D4580 Standard Practice for Measuring Delaminations in Concrete Bridge Decks by Sounding

543 including visual inspections for cracks and other defects in the presence of the
544 Engineer. Seal cracks that are greater than 0.01 inch in width with epoxy
545 materials which are compatible with VESLMC and acceptable to the Engineer.
546 Remedy, remove, or replace unacceptable areas with VESLMC using
547 installation methods as specified in this section at no increase in contract time
548 or contract price. Repaired areas will be subject to re-inspection. Provide
549 documents of the post construction surveys that are acceptable to the
550 Engineer.

551
552 **540.04 Measurement.** The Engineer will measure VESLMC on a lump
553 sum basis. Measurement for payment will not apply.

554
555 **540.05 Payment.** The Engineer will pay for accepted VESLMC concrete.
556 Payment will be full compensation for the work prescribed in this section and the
557 contract documents.

558
559 The Engineer will pay for the following pay item when included in the proposal
560 schedule:

Pay Item	Pay Unit
VESLMC for _____	Lump Sum"

561
562
563
564
565
566
567

END OF SECTION 540

1 **DIVISION 600 - MISCELLANEOUS CONSTRUCTION**

2
3 Amend **Section 601 - STRUCTURAL CONCRETE** to read as follows:

4
5 **SECTION 601 - STRUCTURAL CONCRETE**

6
7
8 **601.01 Description.** This section describes structural concrete consisting of
9 Portland Cement, fine aggregate, coarse aggregate, and water. This will include
10 adding admixtures for the purpose of entraining air, retarding or accelerating set,
11 tinting, and other purposes as required or permitted. To reduce the embodied carbon
12 footprint of concrete, concrete design on the island of Oahu shall include the use of
13 carbon dioxide mineralization or equivalent technology. Other methods to reduce the
14 cement content such as use of supplementary cementitious materials (SCMs) or
15 admixtures such as C-S-H nanoparticle-based strength-enhancing admixture (CSH-
16 SEA) or equivalent may also be used to reduce the embodied carbon footprint
17 including the combination thereof the previously mentioned methods.

18
19 **601.02 Materials.**

20		
21	Portland Cement	701.01
22		
23	Fine Aggregate for Concrete	703.01
24		
25	Coarse Aggregate for Portland Cement Concrete	703.02
26		
27	Admixtures	711.03
28		
29	Water	712.01
30		

31 Use coarse aggregate for lightweight concrete conforming to ASTM C330
32 except Sections 5, 7 and 9.

33
34 **601.03 Construction.**

35
36 **(A) Quality Control.** Portland Cement concrete production requires
37 Contractor responsibility for quality control of materials during handling,
38 blending, mixing, curing, and placement operations.

39
40 Sample, test, and inspect concrete to ensure quality control of
41 component materials and concrete. Sampling and testing for quality control in
42 accordance with standard methods shall be performed by certified ACI
43 Concrete Field Technician Grade I. Perform quality control tests for slump, air
44 content, temperature, and unit weight during production of structural concrete
45 other than concrete for incidental construction. Submit quality control test
46 results.

47 **(B) Design and Designation of Concrete.** Design concrete mixture for
48 concrete work specified. Submit mix design using State Highways Division
49 form DOT 4-151 or an Engineer accepted equivalent form. Do not start work
50 until the Engineer accepts mix design. The Engineer will accept concrete mix
51 design using information given in Table 601.03-1 - Design of Concrete, and
52 other pertinent requirements.
53

54 Whenever 28-day compressive strength, f'_c , is 4,000 psi or greater,
55 designate concrete by required minimum 28-day compressive strength.
56

57 The 28-day compressive strength, f'_c , less than 4,000 psi listed in Table
58 601.03-1 – Design of Concrete, is for design information and designation of
59 class only.
60

61 Proportion concrete designated by compressive strength such that
62 concrete conforms to required strength.
63

64 Design concrete placed in bridge decks and pavements exposed to
65 traffic wear, with air content of 3 percent, including entrapped and entrained
66 air. Maintain air content for plastic concrete within tolerance of 1 percent air
67 content, plus or minus, during the work.
68

69 Use concrete Type SBD where specified in the plans with special
70 requirements as listed below:
71

72 **(a)** A shrinkage reducing admixture (SRA), Master Life SRA35 by
73 BASF or Eclipse by W.R. Grace & Co., or approved equal shall be
74 added to the concrete. The minimum dosage requirement shall be 128
75 ounces per cubic yard of concrete.
76

77 **(b)** A migrating, corrosion-inhibiting, amine-carboxylate, water-based
78 admixture shall be added to the concrete. The minimum dosage shall
79 be 24 ounces per cubic yards of concrete.
80

81 **(c)** The concrete shall have a maximum water to cement ratio of
82 0.40. The weight of the SRA shall be included in the total water when
83 computing the water to cement ratio. The maximum amount of water
84 shall be 268 pounds per cubic yard.
85

86 **(d)** The 28 day compressive strength of the concrete shall be not
87 less than 6,000 psi.
88

89 **(e)** The concrete shall contain 15 pounds of alkali resistant structural
90 glass fiber such as CEMFIL ANTI-CRAK HP67/36 or approved equal
91 per cubic yard.
92

93
94
95
96
97
98
99
100
101
102
103
104
105
106
107
108
109
110

(f) The concrete shall have a maximum shrinkage strain of .00006 at 28 days and .000145 at 56 days according to ASTM C512.

(g) The final concrete mix design shall be based on field trial batches to determine the most suitable materials and proportions that will provide a concrete mixture having the least amount of segregation and bleeding, and at the same time provide the necessary workability to meet placing requirements

Type SBD concrete shall utilize CO₂ Mineralization technology, Supplementary cementitious materials (SCMs), CSH-SEA, or equivalent as stated in this section.

Class A concrete shall be used when type of concrete is not indicated in the contract documents.

Design concrete as specified in Table 601.03-1 – Design of Concrete.

TABLE 601.03-1 - DESIGN OF CONCRETE (800 Maximum Cement Content lbs./c.y.)					
Class of Concrete	28-Day Strength f_c, psi.	Minimum Cement Content lbs./c.y.	Maximum Water-Cement Ratio, lb./lb.	Minimum Cement Content with Mineralized CO2 lbs./c.y.	Maximum Water-Cement Ratio with Mineralized CO2 lb./lb.
A	3000	532	0.59	504	0.62
B	2500	475	0.66	450	0.70
C	2000	418	0.75	396	0.79
D	1500	380	0.85	360	0.87
SEAL	3000	610	0.55	NA	NA
Designated by Strength f _c or *f _r	As Specified	610	0.49	NA	NA
*f _r = Specified Modulus of Rupture					

111
112
113
114
115
116
117
118

Concrete Design – Projects on Oahu will utilize CO₂ Mineralization technology or equivalent. Supplementary cementitious materials (SCMs), CSH-SEA or equivalent or combination thereof the previously mentioned methods may also be used. Concrete design shall allow a reduction of portland cement content while maintaining the concrete design strength, durability and other requirements. See Table 601.03-1 Design of Concrete specified limits for adjusted minimum cement content and water cement ratio

119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137
138
139
140
141

when using CO₂ mineralization. Material certifications for the above shall include a list of at least 3 projects that used the technology, SCMs, admixtures or combination thereof.

Use the absolute volume method to proportion concrete materials in accordance with requirements of concrete designated by class, cement content in pounds per cubic yards, or specified 28-day compressive strength. Use absolute volumetric proportioning methods as outlined in the American Concrete Institute (ACI) Standard 211.1, "Recommended Practices for Selecting Proportions for Normal and Heavyweight Concrete."

Use coarse aggregate size No. 57 (one inch to No. 4) or No. 67 (3/4 inch to No. 4) for concrete. For concrete placed in bottom slabs and stems of box girders, use No. 67 size aggregate. Smaller size aggregates may be permitted when encountering limited space between forms and reinforcement or between reinforcement when accepted by the Engineer in writing. Maximum aggregate size shall not be greater than 1/3 of the space between reinforcing steel bars or reinforcing steel and the form.

Use the following standard methods in Table 601.03-2 – Standard Methods for determining compliance with requirements indicated in this subsection:

TABLE 601.03-2 – STANDARD METHODS	
Sampling Fresh Mixed Concrete	AASHTO T 141
Mass Per Cubic Meter (Cubic Foot) Yield and Air Content (Gravimetric) of Concrete	AASHTO T 121
Slump of Hydraulic Cement Concrete	AASHTO T 119
Air Content of Freshly Mixed Concrete by the Pressure Method	AASHTO T 152
Specific Gravity and Absorption of Fine Aggregate	AASHTO T 84
Specific Gravity and Absorption of Coarse Aggregate	AASHTO T 85
Temperature of Freshly Mixed Portland Cement Concrete	ASTM C1064
Making and Curing Concrete Test Specimens in the Field	AASHTO T 23
Compressive Strength of Molded Concrete Cylindrical Specimens	AASHTO T 22 (4 inch by 8 inch or 6 inch by

	12 inch cylinders)
Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)	AASHTO T 97

142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181
182
183

When concrete is designated by compressive strength, f'_c , or flexural strength, f'_r , or includes CO₂ Mineralization technology, CSH-SEA or SCMs, the Engineer will require prequalification of materials and mix proportions proposed for use before placing such concrete. The Engineer will prequalify concrete based on past performance records using statistical computations of population sizes and (n-1) weighting, or trial batch test reports in compliance with computed minimum average strength for material and mix proportions. The Engineer will determine minimum average strength on probability of not more than one in 20 tests falling below specified strength for the following conditions:

(1) When past performance records are available, furnish the following documented performance records:

(a) Minimum of 15 consecutive 28-day strength tests from projects having same materials and mix proportions.

(b) Two groups totaling 30 or more test results representing similar materials in which mix proportion strengths are within 20 percent of specified strength, from data obtained within one year of proposed use.

The Engineer will analyze performance records to establish standard deviation.

(2) When sufficient past performance records are not provided, the Engineer will assume current standard deviation to be 500 psi for compressive strength, f'_c , and 50 psi for flexural strength, f'_r .

Unless sufficient performance records are available from other projects at DOT Materials Testing and Research Branch, submit test performance records or trial test reports for prequalifications, based on data of most recent tests made on concrete of proposed mix design, and data obtained within one year of proposed use.

When shrinkage reducing admixtures are used, submit test results showing compliance to the Contract Documents' requirements.

Include the following information in test data and trial batch test reports: date of mixing; mixing equipment and procedures used; size of batch in cubic yards and weight, type, and source of ingredients used; slump of concrete; air

184 content of concrete when using air entraining agent; age at time of testing; and
185 strength of concrete cylinders tested.

186
187 Show that concrete strength tests equal or exceed minimum average
188 strength in trial test reports. Test is average 28-day test results of five
189 consecutive concrete cylinders or concrete beams taken from single batch. No
190 cylinder or beam shall have strength less than 85 percent of minimum average
191 strength.

192
193 Submit test data and trial test reports signed by official of firm that
194 performed tests.

195
196 The Engineer reserves the right to stop work when a series of low
197 strength tests occur. Do not continue concrete work until cause is established
198 and the Engineer is informed of and accepts, necessary corrective action to be
199 taken.

200
201 **(C) Batching.** Measure and batch materials in accordance with the
202 following provisions:

203
204 **(1) Portland Cement.** Either sacked or bulk cement may be used.
205 Do not use fraction of sack of cement in concrete batch unless cement
206 is weighed.

207
208 Weigh bulk cement on weighing device accepted by the Engineer. Seal
209 and vent bulk cement-weighing hopper properly to preclude dusting
210 during operation. Do not suspend discharge chute from weighing
211 hopper. Arrange discharge chute so that cement will not lodge in
212 hopper or leak from hopper.

213
214 Batching accuracy shall be within 1 percent, plus or minus, of
215 required weight.

216
217 **(2) Water.** Measure water by volume or by weight. Use readily
218 adjustable device for measurement of water, with accuracy within 1
219 percent, plus or minus, of quantity of water required for batch. Arrange
220 device so that variable pressure in water supply line does not affect
221 measurements. Equip measuring tanks with outside taps and valves or
222 other accepted means to allow for checking calibration.

223
224 **(3) Aggregates.** When storing and stockpiling aggregates, avoid
225 separation of coarse and fine particles within each size, and do not
226 intermix various sizes before proportioning. Protect stored or stockpiled
227 aggregates from dust or other foreign matter. Do not stockpile together,
228 aggregates from different sources and of different gradations.

229
230
231
232
233
234
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
273
274

When transporting aggregates from stockpiles or other sources to batching plant, ensure uniform grading of material is maintained. Do not use aggregates that have become segregated or mixed with earth or foreign matter. Stockpile or bin aggregates at least 12 hours before batching. Produce or handle aggregates by hydraulic methods and wash and drain aggregates. If aggregates exhibit high or non-uniform moisture content, the Engineer will order storage or stockpiling for more than 12 hours.

Proportion aggregates by weight, with the exception that aggregates in concrete for minor structures, curbs, and sidewalks may be proportioned by either volume or weight. For volumetric proportioning, use measuring boxes of known capacity to measure quantity of each aggregate size.

Use batch weight based on dry materials plus total weight of moisture (both absorbed and surface) contained in aggregate. Measure individual aggregates to within 2 percent, plus or minus, of required weight, and total weight of aggregates to within 1 percent, plus or minus, of required weight.

(4) Admixtures. All admixtures shall be compatible with each other. Admixtures which significantly increase the drying shrinkage or creep in the concrete may be rejected by the Engineer. Store, proportion, and dispense admixtures in accordance with the following provisions:

(a) Liquid Admixtures. Dispense chemical admixtures, air entraining admixtures, and corrosion inhibiting admixtures in liquid form. Use mechanical dispensers for liquid admixtures with sufficient capacity to measure prescribed quantity for each batch of concrete. Include graduated measuring unit in each dispenser to measure liquid admixtures to within 5 percent, plus or minus, of prescribed quantity for each batch. Read graduations accurately from point of measuring unit, and control proportioning operations to permit visual check of batch accuracy before discharging. Mark each measuring unit clearly for type and quantity of admixture.

Arrange with supplier to provide sampling device consisting of valve located in safe and accessible location for sampling admixtures.

When using more than one liquid admixture for concrete mix, use separate measuring unit for each liquid admixture and dispense separately to avoid interaction that may interfere with admixture efficiency and adversely affect concrete. Dispense

275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
292
293
294
295
296
297
298
299
300
301
302
303
304
305
306
307
308
309
310
311
312
313
314
315
316
317
318
319
320
321

liquid admixture by injecting so as not to mix admixture at high concentrations.

When using liquid admixtures in concrete that is completely mixed in paving or continuous mixers, operate dispensers automatically with batching control equipment. Equip such dispensers with automatic warning system that shall provide visible or audible signals at points where proportioning operations are controlled, when the following occurs:

- a. Quantity of admixture measured for each batch of concrete varies from pre-selected dosage by more than 5 percent; or
- b. Entire contents of measuring unit from dispenser is not emptied into each batch of concrete.

Unless liquid admixtures are added to batch with pre-measured water, discharge liquid admixtures into stream of water that disperses admixtures uniformly throughout batch. An exception is that air-entraining admixtures may be dispensed directly into moist sand in batching bins, provided adequate control of concrete air content can be maintained.

Measure and disperse special admixtures, as recommended by admixture manufacturer, and as accepted by the Engineer. Special admixtures include high-range water reducers requiring dosages greater than capacity of conventional dispensing equipment. For site-added, high-range water reducers, use calibrated, portable dispenser supplied by manufacturer.

(b) Mineral Admixtures. Protect mineral admixtures from exposure to moisture until used. Pile sacked material of each shipment to permit access for tally, inspection, and identification.

Provide adequate facilities to ensure that mineral admixtures meeting specified requirements are kept separate from other mineral admixtures and that only specified mineral admixtures are allowed to enter into the work. Provide safe and suitable facilities for sampling mineral admixtures at weigh hopper or in feed line immediately in advance of hopper.

Incorporate mineral admixtures into concrete using equipment conforming requirements for Portland Cement weigh hoppers and charging and discharging mechanisms specified in ASTM C94 and Subsection 601.03(C) - Batching.

322 When concrete is completely mixed in stationary paving
323 or continuous mixers, weigh mineral admixture in separate
324 weigh hopper. Introduce mineral admixture and cement
325 simultaneously into mixer, proportionately with aggregate.
326

327 When interlocks are required for cement-charging
328 mechanisms, and cement and mineral admixtures are weighed
329 cumulatively, interlock their charging mechanisms to prevent
330 introduction of mineral admixture until mass of cement in weigh
331 hopper is within tolerances specified in Subsection 601.03(C)(1)
332 - Portland Cement.
333

334 In determining maximum quantity of free water that may
335 be used in concrete, consider mineral admixture and
336 supplementary cementitious materials (SCMs) to be cement.
337

338 **(5) Bins and Scales.** At batching plant, use individual bins,
339 hoppers, and scale for each aggregate size. Include separate bin,
340 hopper, and scale for bulk cement and fly ash.
341

342 Except when proportioning bulk cement for pavement or
343 structures, cement weigh hopper may be attached to separate scale for
344 individual weighing or to aggregate scale for cumulative weighing. If
345 cement is weighed cumulatively, weigh cement before other
346 ingredients.
347

348 When proportioning for pavement or structures, keep bulk
349 cement scale and weigh hopper separate and distinct from aggregate
350 weighing equipment.
351

352 Use springless-dial or beam-type batching scales. When using
353 beam-type scales, make provisions to show operator that required load
354 in weighing hopper is approaching. Use devices that show condition
355 within last 200 pounds of load and within 50 pounds of overload.
356

357 Maintain scale accuracy to 0.5 percent throughout range of use.
358 Design poises to lock to prevent unauthorized change of position. Use
359 scales inspected by the State Measurement Standards Branch of the
360 Department of Agriculture to ensure their continued accuracy. Provide
361 not less than ten 50-pound weights for testing scales.
362

363 Batching plants may be equipped to proportion aggregates and
364 bulk cement by automatic weighing devices.
365

366
367
368
369
370
371
372
373
374
375
376
377
378
379
380
381
382
383
384
385
386
387
388
389
390
391
392
393
394
395
396
397
398
399
400
401
402
403
404
405

(6) Batching and Hauling. When mixing is to be performed at work site, transport aggregates from batching plant to mixer in batch boxes, vehicle bodies, or other containers of adequate capacity and construction. Use partitions to separate batches and prevent spilling from one compartment to another while in transit or during dumping.

Transport bulk cement to mixer in tight compartments carrying full quantity of cement required for batch. Once cement is placed in contact with aggregates, batches shall be mixed and placed within 1-1/2 hours of contact. Cement in original shipping packages may be transported on top of aggregates. Ensure that each batch contains number of sacks required by job mix.

Deliver batches to mixer intact. Charge each batch into mixer without loss of cement. When carrying more than one batch on truck, charge batch into mixer without spilling material from one batch compartment into another.

(D) Mixing. Mix concrete in mechanically operated mixers.

Use stationary or truck mixers that distribute materials thoroughly and produce concrete uniform in color and appearance. When there is variation in mixed concrete attributable to worn pickup or throw-over blades, the Engineer will inspect mixer. If inspection reveals that blades are worn more than one inch below original height of manufacturer's design, repair or replace blades. Upon request, make copy of manufacturer's design, showing dimensions and arrangement of blades.

Charge batches into central or truck mixers so that portion of mixing water enters ahead of cement and aggregates. Deliver uniform flow of water. Place entire amount of batch water in mixer by end of first quarter of mixing period. When mixers with multiple compartment drums are used, time required to transfer material between compartments will be included as mixing time. Use drum rotation speed as designated by manufacturer. If mixing does not produce concrete of uniform and smooth texture, provide additional revolutions at same speed until thorough mixing of each concrete batch is attained. Begin measuring mixing time from time cement, aggregates, and 60 percent of water are in drum. Do not exceed manufacturer's rated capacity for volume of concrete mixed in each batch.

406 Equip central or truck mixers with attachment for automatically timing
407 mixing of each concrete batch. Timing device shall include automatic feature
408 for locking discharge chute and device for warning operator when required
409 mixing duration has been met. If timing or locking device fails to operate,
410 immediately furnish clock or watch that indicates seconds, to mixer operator. If
411 timing device is not repaired within three days after becoming inoperative, shut
412 down batching operation until timing device is repaired.
413

414 For stationary mixers, use mixing time between 50 seconds and 5
415 minutes. Select mixing time, as necessary, to produce concrete that meets
416 uniformity criteria when tested in accordance with Section 11.3.3 of ASTM
417 C94. The Contractor may designate mixing time for which uniformity tests are
418 to be performed, provided mixing time is not less than 50 seconds or more
419 than 5 minutes. Before using concrete for pavements or structures, mix
420 concrete to meet specified uniformity requirements. The Contractor shall
421 furnish labor, sampling equipment, and materials required for conducting
422 uniformity tests of concrete mixture. The Engineer will furnish required testing
423 equipment, including scales, cubic measure, and air meter; and will perform
424 tests. The Engineer will not pay separately for labor, equipment, materials, or
425 testing, but will consider the costs incidental to concrete. After batching and
426 mixing operational procedures are established, the Engineer will not allow
427 changes in procedures without the Contractor re-establishing procedures by
428 conducting uniformity tests. Repeat mixer performance tests whenever
429 appearance of concrete or coarse aggregate content of samples is not
430 conforming to requirements of ASTM C94. For truck mixers, add four seconds
431 to specified mixing time if timing starts as soon as skip reaches its maximum
432 raised position.
433

434 Unless otherwise indicated in the contract documents or accepted by
435 the Engineer, concrete shall be mixed at proportioning plant. Operate mixer at
436 agitating speed while in transit. Concrete may be truck-mixed only when
437 cement or cement and mixing water are added at point of delivery. Begin
438 mixing truck-mixed concrete immediately after introduction of mixing water to
439 cement and aggregates, or introduction of cement to aggregates.
440

441 Inclined-axis, revolving drum truck mixers shall conform to Truck Mixer,
442 Agitator and Front Discharge Concrete Carrier Standards TMMB 100-01, 15th
443 Revision, published by Truck Mixer Manufacturers Bureau. Truck mixers shall
444 produce thoroughly mixed and uniform mass of concrete and shall discharge
445 concrete without segregation.
446

447 Manufacturer's standard metal rating plate shall be attached to each
448 truck mixer, stating maximum rating capacity in terms of volume of mixed
449 concrete for various uses and maximum and minimum mixing speeds. When
450 using truck mixers for mixing, adhere to maximum capacity shown on metal
451 rating plate for volume of concrete in each batch.

452 Operate truck mixers at mixing speed designated by manufacturer, but
453 at not less than 6 or more than 18 revolutions per minute. Mix truck-mixed
454 concrete initially between 70 and 100 revolutions at manufacturer-designated
455 mixing speed, after ingredients, including water, are in mixer. Water may be
456 added to mixture not more than two times after initial mixing is completed.
457 Each time that water is added, turn drum an additional 30 revolutions or more
458 at mixing speed until concrete is mixed uniformly.

459
460 When furnishing shrink-mixed concrete, transfer partially mixed
461 concrete at central plant to truck mixer. Apply requirements for truck-mixed
462 concrete. The Engineer will not credit number of revolutions at mixing speed
463 for partial mixing in central plant.

464
465 When accepted by the Engineer, hand mixing may be allowed. The
466 entire concrete placement at one location shall not exceed 1/3 cubic yard.
467 It shall be hand mixed on a watertight, level platform. Use no aluminum to
468 construct platform. Measure proper amount of coarse aggregate in
469 measuring boxes and spread on platform. Spread fine aggregate on that
470 coarse aggregate layer. Limit coarse and fine aggregate layers to total
471 depth of one foot. Spread dry cement on this mixture. Turn whole mass
472 not less than two times dry. Add sufficient clean water, distributed evenly.
473 Turn whole mass again, not less than three times, not including placing in
474 carriers or forms.

475
476 **(E) Transporting Mixed Concrete.** Transport central-mixed concrete to
477 delivery point in truck agitators or truck mixers operating at speed designated
478 by equipment manufacturer as agitating speed; or in non-agitating hauling
479 equipment, provided consistency and workability of mixed concrete upon
480 discharge at delivery point is suitable for placement and consolidation in place;
481 and provided mixed concrete after hauling to delivery point conforms to
482 uniformity criteria when tested as specified in ASTM C94.

483
484 For revolving drum truck mixers transporting central-mixed concrete,
485 limit concrete volume to manufacturer's rated capacity for agitator operation.
486 Maintain agitating speed for both revolving drum mixers and revolving blade
487 type agitators as designated on manufacturer's data plate. Equip truck mixers
488 or truck agitators with electrically or mechanically actuated counters. Actuate
489 counters after introducing cement to aggregates.

490
491 Bodies of non-agitating hauling equipment shall be smooth, watertight,
492 metal containers equipped with gates to permit control of concrete discharge.
493 Protect open-topped haul vehicle against weather with cover accepted by the
494 Engineer.

495
496 When hauling concrete in non-agitating trucks, complete discharge
497 within 30 minutes after introducing mixing water to cement and aggregates.
498

499 When truck mixer or agitator is used for transporting central-mixed
500 concrete to delivery point, complete discharge within 1-1/2 hours, or before
501 250 revolutions of drum or blades, whichever comes first after introduction of
502 mixing water to cement and aggregates, or cement to aggregates. For truck-
503 mixed concrete, complete concrete discharge within 1-1/2 hours, or before 300
504 revolutions of drum or blades, whichever comes first. These limitations are
505 permitted to waived if concrete is of such slump after the 1-1/2 hour time or
506 300-revolution limit has been reached, that it can be placed, without addition of
507 water to the batch.

508
509 Submit delivery tickets from manufacturers of truck-mixed concrete and
510 central-mixed concrete with each truckload of concrete before unloading at
511 jobsite. Printed, stamped, or written delivery ticket shall include the following
512 information:

- 513
514 **(1)** Name of concrete plants.
- 515
516 **(2)** Serial number of ticket.
- 517
518 **(3)** Date and truck number.
- 519
520 **(4)** Name of Contractor.
- 521
522 **(5)** Specific project, route, or designation of job (name and location),
523 and truck overweight permit number when required.
- 524
525 **(6)** Specific class or designation of concrete in accordance with
526 contract documents.
- 527
528 **(7)** Quantity of concrete in cubic yards.
- 529
530 **(8)** Time of loading batch or mixing of cement and aggregates.
- 531
532 **(9)** Water added by receiver of concrete and receiver's initials.
- 533
534 **(10)** Information necessary to calculate total mixing water added by
535 producer. Total mixing water includes free water on aggregates, water,
536 and water added by truck operator from mixer tank.
- 537
538 **(11)** Readings of non-resettable revolution counters of truck mixers
539 after introduction of cement to aggregates, or introduction of mixing
540 water to cement aggregates.
- 541
542 **(12)** Supplier's mix number or code.
- 543

Furnish additional information designated by the Engineer and required by job specifications upon request.

(F) Consistency. Regulate quantity of water used in concrete mixes so that concrete consistency, as determined by AASHTO T 119 test method, is within nominal slump range specified in Table 601.03-3 - Slump for Concrete or as stated on the accepted concrete mix design. If concrete slump exceeds nominal slump, adjust mixture of subsequent batches. If slump exceeds maximum slump, the Engineer will reject concrete unless deemed satisfactory for its use.

The Engineer will also reject harsh or unworkable concrete that cannot be properly placed. Remove rejected concrete at no increase in contract price or contract time.

Slump for concrete shall be as specified in Table 601.03-3 – Slump for Concrete.

TABLE 601.03-3 - SLUMP FOR CONCRETE		
Type of Work	Nominal Slump Inches	Maximum Slump Inches
Concrete Pavements	0 – 3	3-1/2
Reinforced Concrete Structures:		
Sections Over 12 Inches	0 – 4	5
Sections 12 Inches Thick or Less	2 – 5	6
Non-Reinforced Concrete Facilities	1 – 3	4
Concrete Placed Underwater	6 – 8	9
Bridge Decks	4 – 6	7

If the slump of the ready mix concrete upon delivery is below the design slump, water may be added provided:

- (1)** Water shall not be added to the concrete if more than ¼ cubic of concrete has been discharged from the mixer.
- (2)** Water may be added only up to 30 minutes after the average travel time to the jobsite.
- (3)** The maximum slump, the maximum water/cement ratio, and the maximum water per cubic yard shall not be exceeded.
- (4)** Not more than 1 ½ gallons of water per cubic yard shall be added to the concrete, but not more than the amount of “held-back”

577
578
579
580
581
582
583
584
585
586
587
588
589
590
591
592
593
594
595
596
597
598
599
600
601
602
603
604
605
606
607

water.

(5) The amount of “held-back” water from the approved mix design shall be shown on the delivery ticket.

In adverse or difficult conditions that may affect placement of concrete, the above slump limitations may be exceeded for placement workability, with the addition of admixture conforming to Subsection 711.03 - Admixtures, if accepted by the Engineer in writing and provided water-cement ratio is maintained. Provide additional cement and water, or admixture at no increase in contract price or contract time.

(G) Forms. Construct forms in accordance with applicable sections.

(H) Placing Concrete. Place concrete in accordance with applicable sections.

(I) Finishing Concrete Surfaces. Finish concrete surfaces in accordance with applicable sections.

(J) Curing Concrete. Cure concrete in accordance with applicable sections.

601.04 Measurement. The Engineer will measure concrete in accordance with the applicable sections.

601.05 Payment. The Engineer will pay for the accepted concrete under the applicable sections.

END OF SECTION 601

SECTION 602 - REINFORCING STEEL

Make the following amendments to said Section:

(I) Amend **Subsection 602.03(D) Placing and Fastening** by revising the first sentence of the first paragraph between lines 58 and 60 to read as follows:

“Unless otherwise indicated in the contract documents, place and fasten reinforcing steel in accordance with the CRSI Placing Reinforcing Bars and the *CRSI Manual of Standard Practice*.”

(II) Amend **Subsection 602.03(D) Placing and Fastening** by adding the following sentence to Note 1 in Table 602.03-1 Placement Tolerances at line 68:

“Note 1 is not applicable for deck slabs, approach slabs, and sleeper slabs.”

(III) Amend **Subsection 602.03(D) Placing and Fastening** by amending the last sentence of paragraph three at line 79 and 80 to read as follows:

“All plastic bar supports will be allowed only in prestressed concrete members and for vertical positions in drilled shafts.”

(IV) Amend **Subsection 602.03(E)(1)(b)** by revising the number 33 to read 50 at line 159.

(V) Amend **Subsection 602.03(E)(3) Butt-Joined Splices** by replacing the last sentence of the first paragraph between lines 262 and 263 with the following sentence:

“Completed butt splices shall develop not less than the specified tensile strength of the unspliced bars.”

(VI) Amend **Subsection 602.03(E)(3)(b)1.d General** by deleting the words “of 125 percent of specified yield strength” in subparagraph d. at lines 443 and 444.”

(VII) Amend **Section 602.05 Payment** by adding the following after the last sentence at line 825:

“The contract lump sum amount paid shall be in full compensation for all splices, rust primer, headed reinforcing steel, couplers, and for equipment, tools, labor, materials and incidentals necessary to complete the work.”

END OF SECTION 602

1 **SECTION 603 – CULVERTS AND STORM DRAINS**

2
3 Make the following amendments to said Section:

4
5 **(I)** Amend **603.03(C)(1) - Culverts** by revising lines 106 to 108 to read as
6 follows:

7
8 “Spacing between multi-barrel culverts shall be a minimum of 18 inches or
9 0.5 the culvert width, whichever is greater. The minimum spacing shall be 1 foot
10 when placing controlled low strength material (CLSM) as backfill. Anchor the
11 culverts in such a manner that the horizontal and vertical alignment of the
12 culverts does not change.”

13
14 **(II)** Amend **603.04 – Measurement** by revising lines 282 to 292 to read as
15 follows:

16
17 **“603.04 Measurement.**

18
19 **(A)** The Engineer will measure bed course material for culverts per
20 cubic yard in accordance with contract documents.

21
22 **(B)** The Engineer will measure reinforced concrete pipe per linear foot
23 in accordance with contract documents.

24
25 **(C)** The Engineer will measure cleaning of existing culverts on a force
26 account basis in accordance with Subsection 109.06 - Force Account
27 Provisions and Compensation and as ordered by the Engineer.”

28
29 **(III)** Amend **603.05 – Payment** by revising lines 294 to 348 to read as follows:

30
31 **“603.05 Payment.** The Engineer will pay for the accepted pay items listed
32 below at the contract price per pay unit, as shown in the proposal schedule.
33 Payment will be full compensation for the work prescribed in this section and
34 contract documents.

35
36 The Engineer will pay for each of the following pay items when included in
37 the proposal schedule:

38

Pay Item	Pay Unit
Bed Course Material for Culvert	Cubic Yard
_____ - Inch Reinforced Concrete Pipe, Class III	Linear Foot

39
40
41
42
43
44

45 **(IV)** Amend **603.05 – Payment** by deleting lines 356 to 357.

46
47 **END OF SECTION 603**

1 **SECTION 607 – CHAIN LINK FENCES AND GATES**

2
3 Make the following amendments to said Section:

4
5 **(I)** Amend **607.04 – Measurement** by revising lines 105 to 106 to read as
6 follows:

7
8 **“607.04 Measurement.** The Engineer will measure chain link fence of the
9 various types by the linear foot. The Engineer will measure chain link gate of the
10 various dimensions per each in accordance with the contract documents.”

11
12 **(II)** Amend **607.05 Payment** by revising lines 108 to 115 to read as follows:

13
14 **“607.05 Payment.** The Engineer will pay for the accepted chain link fence
15 by the linear foot and the accepted chain link gate per each. Payment will be
16 full compensation for the work prescribed in this section and the contract
17 documents.

18
19 The Engineer will pay for each of the following pay items when included in
20 the proposal schedule:

Pay Item	Pay Unit
_____ - Feet, Chain Link Fence	Linear Foot
Chain Link Gate, _____ Feet High And _____ Feet Wide	Each”

21
22
23
24
25
26
27
28
29
30 **END OF SECTION 607**

1 **SECTION 614 – STREET SURVEY MONUMENTS**

2
3 Make the following amendments to said Section:

4
5 **(I)** Amend **614.04 – Measurement** by revising lines 25 to 36 to read as
6 follows:

7
8 **“614.04 Measurement.**

9
10 **(A) New Standard Street Survey Monument.** The Engineer will
11 measure new standard street survey monuments per each in accordance
12 with the contract documents.

13
14 **(B) Adjusting Standard Street Survey Monument.** Adjusting
15 standard street survey monuments will be incidental. Measurement for
16 payment will not apply.

17
18 **(II)** Amend **614.05 – Payment** by revising lines 38 to 57 to read as follows:

19
20 **“614.05 Payment.**

21
22 **(A)** The Engineer will pay for the accepted new standard street
23 survey monuments at the contract unit price per each. Payment will be full
24 compensation for the work prescribed in this section and the contract
25 documents.

26
27 **(B)** Payment for adjusting standard street survey monuments will be
28 incidental.

29
30 The Engineer will pay for each of the following pay items when included in
31 the proposal schedule:

32

Pay Item	Pay Unit
(A) New Street Survey Monuments	Each”

33
34
35
36
37

38 **END OF SECTION 614**

39

1 **SECTION 619 – PLANTING**

2
3 Make the following amendments to said Section:

4
5 **(I) Amend 619.04 Measurement** to read as follows:

6
7 **“619.04 Measurement.** Planting will be paid on a lump sum basis.
8 Measurement for payment will not apply.”

9
10 **(II) Amend 619.05 Payment** by revising lines 541 to 556 to read as follows:

11
12 **“619.05 Payment.** The Engineer will pay for the accepted planting on a
13 contract lump sum basis. Payment will be full compensation for work prescribed
14 in this section and the contract documents.

15
16 The Engineer will pay for each of the following pay items when included in
17 the proposal schedule.

18

Pay Item	Pay Unit
Planting	Lump Sum”

19
20
21
22
23

24 **END OF SECTION 619**

25

1 Make the following section a part of the Standard Specifications:
2

3 **“SECTION 621 – ENHANCED VEHICLE CLASSIFICATION SYSTEM**
4

5 **621.01 Description.** This work includes furnishing labor, materials, tools,
6 machinery, and equipment necessary to install new Enhanced Vehicle Classification
7 (EVC) System(s) or restore existing EVC System(s), complete in place according to the
8 Contract. The Contractor shall make improvements as shown in the Contract, including
9 the following:
10

11 **(A)** Provide for traffic counting and classification operations by installing (new
12 stations) or replacing (existing stations) classification sensors (piezoelectric
13 sensors), vehicle detector inductance loops (loop sensors), conduits, cable
14 wiring, EVC controller cabinet(s), and electrical and communications service.
15

16 **(B)** Install (new stations) or restore (existing stations) the electrical and
17 communications service and metering facilities and pay for the electric
18 company’s and the communications company’s services when Contract
19 Documents call for these utility services. When Contract Documents call for utility
20 service connections, the Contractor shall coordinate service agreements with the
21 respective electric company, communications company, and the respective State
22 of Hawaii Department of Transportation (HDOT) District Engineer.
23

24 **(C)** For new stations, provide underground conduit systems including
25 trenching and structural excavation. Furnish and install pull boxes. Provide
26 backfilling and restoration work required to install the new EVC System(s) and
27 restore other improvements at the site(s). For station restorations, provide new
28 conduits, pull boxes, and necessary trenching, excavation, backfilling, and
29 restoration of other improvements as called for in Contract Plans.
30

31 **(D)** Coordinate work with and arrange for inspection of work by the Engineer.
32 Arrange for a representative from the piezoelectric sensor’s manufacturer to
33 supervise installation of piezoelectric sensors.
34

35 **(E)** Conduct required testing of the loop sensors and piezoelectric sensors.
36 Submit acceptance test procedures and criteria for acceptance test results to the
37 Engineer. Notify the Engineer a minimum of 1 week before the date scheduled
38 for testing.
39

40 **(F)** Turn over to the Engineer complete and operating EVC System(s)
41 according to the Contract.
42

43 Furnish and install incidental parts necessary to complete the EVC System(s) as though
44 such parts were in the Contract.
45

46 **621.02 Materials.** Electrical equipment shall conform to the National Electrical
47 Manufacturers Association (NEMA) Standards and this Contract. Materials and
48 workmanship shall conform to the National Electric Code (NEC), General Order Nos. 6
49 and 10 of the Hawaii Public Utilities Commission, ASTM standards, the ANSI, and
50 applicable revisions for all the above codes, standards, and local ordinances that may
51 apply.

52
53 **(A) Piezoelectric Sensors (Piezo Sensors).**

54
55 **(1)** Piezo sensors shall meet the following conditions:

56
57 **(a)** Be Class 1 BL Weigh-in-Motion unencapsulated
58 piezoelectric sensors.

59
60 **(b)** Have a minimum operating life of 1 year from the date of
61 acceptance.

62
63 **(c)** Meet the requirements as outlined in the FHWA document *A*
64 *Summary of Vehicle Detection and Surveillance Technologies Used*
65 *in Intelligent Transportation Systems.*

66
67 **(d)** Be of the length shown in the Contract Plans (or as
68 determined by the Engineer).

69
70 **(e)** Be manufactured complete with the piezo sensor lead cable
71 and the sensor itself as one integral unit.

72
73 **(f)** Have a 16 gauge, flat, braided, silver plated copper wire
74 center core that is spiral-wrapped by PVDF piezoelectric film.

75
76 **(g)** Have an outer sheath of 0.16-inch thick brass meeting CDA
77 260, as required by ASTM B587-19, *Standard Specification for*
78 *Welded Brass Tube.*

79
80 **(h)** Be approximately 0.26 inches wide, with a maximum
81 thickness of 0.063 inch (plus/minus 0.005 inch).

82
83 **(i)** Have insulation resistance between core and shield greater
84 than 500 megohms.

85
86 **(j)** Have a nominal piezoelectric coefficient greater than or
87 equal to 20 pC/N.

88
89 **(k)** Have designs and installation techniques proven reliable in
90 soil and environmental conditions similar to those in Hawaii.
91

92
93
94
95
96
97
98
99
100
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137

- (l) Be able to withstand at least 1 million cycles.
- (m) Have a compatible interface with the electronics housed in the EVC cabinet(s) to perform the applications required for the EVC System(s).
- (n) Include all mounting hardware and PU200 piezo installation resin (or equivalent) used for installation.
- (2) The piezo sensor lead cable to the EVC cabinet(s) shall meet the following conditions:

 - (a) Be manufactured complete with the piezo sensor lead cable and the sensor itself as one integral unit.
 - (b) Be RG58 type, rated for underground direct burial.
 - (c) Have an outer jacket of 0.187-inch outside diameter.
 - (d) Have a nominal capacitance of at least 27 pF/ft.
 - (e) Be field measured so that the length of piezo sensor lead cable ordered suits the installation conditions.
 - (f) Be sufficiently long to reach the EVC cabinet(s) with at least an additional 12 inches extra slack within the cabinet(s). Excess piezo lead cable, beyond the 12 inches of slack, shall be trimmed in the field during installation.
 - (g) The maximum length of piezo lead cable shall be 300 feet.
 - (h) Splicing of the piezo sensor lead cable will not be allowed under any condition.
- (3) The supplied PU200 piezo installation resin (or equivalent) shall meet the following conditions:

 - (a) Be suitable for installation in both Asphalt Concrete (AC) and Portland Cement Concrete (PCC) pavements.
 - (b) Have a short curing time (less than 75 minutes) to minimize lane closure time.
 - (c) Be of sufficiently thick consistency to prevent 'running' when being applied in saw cuts.

- 138 (d) Be uniform in consistency such that particulate matter within
139 the sealant does not separate or settle.
140
141 (e) Be approved by the piezo sensor manufacturer and the
142 Engineer.
143
144 (4) An appropriate in-road temperature sensor shall be supplied to
145 provide temperature correction data for the piezo sensors. The
146 temperature sensor shall be an in-road sensor, as approved by the
147 Engineer.
148
149 **(B) Loop sensors.**
150
151 (1) Loop sensor wire shall meet the following conditions:
152
153 (a) Be polyethylene insulated.
154
155 (b) Be 14 AWG stranded THHN.
156
157 (c) Be 600 Volts rated.
158
159 (d) Be IMSA Spec. 51-3 certified.
160
161 (e) Be tested at the factory prior to shipment.
162
163 (f) Include installation materials and loop sealant for installation.
164
165 (2) Loop sensor home-run cables shall meet the following conditions:
166
167 (a) Be polyethylene insulated.
168
169 (b) Be stranded-tinned-copper 14 AWG.
170
171 (c) Be a 2-conductor cable.
172
173 (d) Have a stranded-tinned-copper drain wire.
174
175 (e) Be aluminum–polyester shielded.
176
177 (f) Be polyethylene jacketed.
178
179 (g) Be 600 Volts rated.
180
181 (h) Be IMSA Spec. 50-2 certified.
182
183 (i) Be tested at the factory prior to shipment.

- 184 (j) Be sufficiently long that the loop sensor home-run cable is
185 one piece that reaches all the way from the pull box (where it is
186 spliced to the twisted pair of loop wires) to the EVC cabinet(s). The
187 cable length shall allow for a service loop of 5 feet of extra slack in
188 pull boxes for each loop sensor home-run cable, and an extra 12
189 inches slack inside the cabinet(s).
190
- 191 (k) Splicing of the home-run cable to the twisted pair of loop
192 wires shall only be allowed at the closest pull box to the loop.
193 Splicing shall only be done using an accepted splice kit.
194
- 195 (3) The supplied loop sealant shall meet the following conditions:
196
- 197 (a) Be compatible with IMSA Spec. 51-3 loop detector wire.
198
- 199 (b) Be suitable for installation in both AC and PCC pavements.
200
- 201 (c) Shall have a short curing time (less than 75 minutes) to
202 minimize lane closure time.
203
- 204 (d) Shall be uniform in consistency such that particulate matter
205 within the sealant does not separate or settle.
206
- 207 (e) Shall be approved by the Engineer.
208
- 209 (C) **Backer Rod.** The Contractor shall use 3/8-inch to 1/2-inch diameter
210 backer rod to secure loop sensor wires at the bottom of saw cuts, as
211 shown on Contract Plans.
212
- 213 (D) **Conduits.** The Contractor shall use PVC-coated galvanized steel
214 electrical conduits for all new above-ground exposed construction, or as
215 directed by the Engineer. PVC conduits shall be used for all new
216 underground construction. All new direct-burial PVC conduits shall be
217 Schedule 80. New PVC conduits under pavement and at utility crossings
218 shall be concrete encased. New concrete-encased PVC conduits can be
219 Schedule 40. New trenched conduits shall conform to Standard Plan TE-
220 35 or TE-36 as indicated on Contract Plans, or as directed by the
221 Engineer. Installation of new conduits must comply with Chapter 6-73,
222 Hawaii Administrative Rules, 'Installation, Operation, and Maintenance of
223 Overhead and Underground Electrical Supply and Communication Lines,'
224 and be installed in areas under pavement before the new pavement is
225 placed.
226
- 227 (1) **Steel Conduits.** New steel conduits shall meet the conditions of
228 Section 712.27(D). 'Rigid Steel Conduit PVC Coated' of the
229 Standard Specifications.

230
231
232
233
234
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
273
274
275

- (2) **Plastic Conduits.** New plastic (PVC) conduits shall meet the conditions of Section 712.27(B). 'Plastic Conduits' of the Standard Specifications.
- (3) **Duct Sealing Compound.** New duct (conduit) sealing compound shall meet the conditions of Section 712.27(E). 'Duct Sealing Compound' of the Standard Specifications.
- (E) **EVC Cabinet(s).** New EVC cabinet(s) shall consist of ground-mounted cabinet(s) on reinforced concrete foundations. EVC cabinet(s) shall be a Caltrans Traffic Signal 332A cabinet or equivalent, with EIA 19" rack, shelf, 30-amp main circuit breaker, surge-protected 6-outlet power strip, LED overhead lights, front and rear door vents with reusable/washable metal filters, and thermostat-controlled fan, as specified on Contract Plans. Cabinet(s) and shall be capable of housing all required communications and control equipment necessary for the EVC System. Cabinet(s) shall be powder coated in anti-graffiti forest green color on the exterior. Contractor shall furnish and install power cables from the Hawaiian Electric Company service point.
- (F) **Pre-cast Foundation(s).** Pre-cast foundation(s) for cabinets and poles shall only be used if accepted by the Engineer. Manufacturer's brochures, catalog cuts, and shop drawings of any pre-cast foundations to be used shall be submitted to the Engineer for acceptance as specified in Section 621.03 (A) below.
- (G) **Wired Telecommunications.** When required by the Contract Documents, if the site has available wired telecommunications service, the service connection facilities shall be supplied (new stations) or restored (existing stations) in accordance with the respective telecommunications service company's requirements. The Contractor shall make any necessary arrangements with the telecommunications company for new or restoration of services.
- (H) **Power.** Power connections and service to new cabinet(s) shall be provided according to the Contract Documents.

 - (1) **Power from Utility Company.** When required by the Contract Documents, if the site has available electrical utility service, the electric power connection facilities shall be supplied in accordance with the respective power company's requirements for electrical service.
 - (2) **Power from Solar Assembly.** When required by the Contract Documents, solar power equipment and connection facilities shall

276 be provided to the cabinet(s) at locations specified in the Contract
277 Plans.

278
279 **(a)** Power to cabinet(s) shall be provided via sealed 12-Volt
280 batteries connected to a solar panel and pole assembly.

281
282 **(b)** The Contractor shall provide a complete solar panel
283 assembly for each cabinet or as required by the Contract
284 Documents. A complete solar panel assembly consists of a
285 minimum of one solar panel, associated supports, pole, concrete
286 foundation, and wiring to the EVC cabinet(s).

287
288 **(c)** Each solar power system shall include surge protection,
289 grounding according to NEC requirements, and a battery charge
290 controller.

291
292 **(d)** The solar power system shall have enough reserve capacity
293 to operate the station uninterrupted for up to three days without
294 charging by the solar panels.

295
296 **(e)** The Contractor shall submit shop drawings of a complete
297 solar power system to the Engineer prior to ordering materials as
298 specified in section 621.03(A) Construction Requirements below.
299 Manufacturer's brochures, catalog cuts, and shop drawings
300 submitted to the Engineer for acceptance shall include information
301 on pole, foundation, wiring, grounding, solar panels, and associated
302 supports. Solar assembly pole(s) shall be located no more than 20
303 feet away from cabinet(s).

304
305 **(H) Excavation Warning Signs.** The Contractor shall furnish and install new
306 warning signs and appropriate mounting adjacent to the sensor lead cable
307 runs or as close as possible to the cables as indicated in the Contract
308 Plans. Signs and mountings shall conform to the requirements of Section
309 750.02, 'Sign Posts' of the Standard Specifications and Standard Plan TE-
310 01, and Contract Documents. For station restorations, existing sign posts
311 are to remain and shall be reused if possible. If new sign posts are
312 required, they shall be no more than 20 feet from cabinet(s). New signs
313 shall be 12 inches wide by 18 inches high. Bottom of signs shall be at 8
314 feet above finished grade. New sign text shall read as follows, where
315 'XXXXXX' shall be replaced with the existing station short name used by
316 Highway Planning Branch. For new stations, new signs shall leave a blank
317 space of length 'XXXXXX' so that once the station short name has been
318 determined, it can be added to the sign later:

319
320
321
WARNING
BURIED TRAFFIC MONITORING LINES

322 NOTIFY HWY-PLANNING BRANCH AT
323 (808) 587-6352 BEFORE DIGGING OR EXCAVATION
324 STATION XXXXXX
325

326 The first line shall be a minimum of 2 inches in height. Subsequent lines of
327 text shall be 1 inch in height. No border is necessary, but a minimum
328 margin of 1/4 inch shall be maintained. For the letters and background,
329 use black and yellow (non-retro-reflective) paints, respectively. The first
330 line of text shall be centered. Subsequent lines shall also be centered;
331 however, the Contractor shall have the option to move the wording within
332 these lines to allow for best fit. Details of the furnished warning signs,
333 mounting, and sign post shall be submitted to the Engineer for acceptance
334 prior to purchase. Furnishing warning signs, mounting, and installation
335 shall be incidental to the Contract.
336

337 (I) **Pull Boxes and Covers.** For station restorations, existing pull boxes are
338 to remain and shall be reused if possible. New pull boxes, if required, shall
339 be furnished and installed as indicated in the Contract Documents. New
340 pull box covers shall be labeled TRAFFIC MONITORING. This label shall
341 be cast or molded into the cover material and not just marked on the cover
342 surface. Pull boxes and covers shall be rated for the largest potential
343 vertical vehicle loads they might encounter, according to their position in
344 shoulders, medians, and traffic lanes, or by direction of the Engineer and
345 as shown in the Contract Documents.
346

347 (J) **Other Materials.** Other materials shall meet the requirements specified in
348 the following sections of the Standard Specifications:
349

350	Structural Concrete	Section 601
351		
352	Reinforcing Steel	Section 602
353		
354	Trench Backfill Material	Subsection 703.21
355		
356	Concrete Pull Box	Subsection 712.06 (B)
357		

358 **621.03 Construction Requirements.**
359

360 (A) **Equipment List and Drawings.** Within 7 days following Contract award,
361 two copies of materials and equipment purchase requisition, including
362 copies of the equipment list, manufacturer's brochures, catalog cuts, and
363 shop drawings shall be submitted to the Engineer for acceptance.
364

365 Materials and equipment shall be ordered immediately upon acceptance
366 by the Engineer. If the Contract award is rescinded by the Department
367 after ordering of materials and equipment, the Department will purchase

368 ordered materials and equipment at cost based on invoices. Purchase
369 price will include transportation cost and applicable State excise taxes.
370 Purchase price will not include profit.

371
372 Upon completion and acceptance of work, an 'As Built' or corrected plan
373 shall be submitted, showing in detail any construction changes per Section
374 648, 'Field Posted Drawings' of the Standard Specifications.

375
376 **(B) Excavation and Backfill.** Excavation and backfill shall be made in
377 accordance with Section 204, 'Excavation and Backfill for Miscellaneous
378 Facilities' of the Standard Specifications. Material from excavation shall be
379 placed to prevent damage and obstruction to vehicular and pedestrian
380 traffic and interference with surface drainage.

381
382 **(C) Installation.** The Contractor shall notify the State and schedule a meeting
383 at least 14 days prior to any construction activity. The State shall install
384 new traffic monitoring equipment and electronics in the cabinet(s) after the
385 installation of the cabinet(s) and sensors. Installation of sensors shall
386 occur after any and all grinding and or milling of the finished pavement
387 surface and after application of pavement markings or striping.

388
389 **(1) Piezo Sensors.**

390
391 **(a)** Installation shall be supervised by the piezo sensor
392 manufacturer's representative.

393
394 **(b)** Construction shall reflect the number and configuration for
395 the piezo sensors as shown in the Contract Plans.

396
397 **(c)** Piezo sensors and leads shall be installed at least 18 inches
398 away from cracks, potholes or joints within the pavement. If the
399 finished pavement at the installation site has cracks, potholes or
400 joints, the number and configuration of piezo sensors shall be
401 modified.

402
403 **(d)** Piezo sensors shall be installed within the roadway, two
404 each per lane, in both traffic directions. Refer to the configuration
405 shown in the Contract Plans.

406
407 **(e)** If the sensor configuration needs to be modified, the
408 Contractor shall inform the State 14 days before the start of
409 construction and submit Shop Drawings of the revised configuration
410 for approval.

411
412 **(f)** A 3/4-inch thick saw blade shall be used to make 3/4-inch
413 wide by 2-inch deep slots for piezo sensors in a single pass of the

414 saw. The slots shall be made as shown in the Contract Plans, or as
415 approved by the Engineer.

416
417 **(g)** A 3/8-inch thick saw blade shall be used to make 3/8-inch
418 wide by 4-inch deep slots (unless shown otherwise on the Contract
419 Plans or by direction of the Engineer) for the piezo sensor lead
420 cables. The transition from the 2-inch deep sensor slot to the 4-inch
421 deep lead cable slot shall be smooth and gradual to prevent a
422 sharp edge under where the lead cable and sensor connect.

423
424 **(h)** Saw cuts shall be made by wet cutting. Dry cutting shall not
425 be allowed.

426
427 **(i)** Dust, dirt, and refuse shall be collected and cleaned away
428 promptly after saw cutting is done. The slots shall be cleared by
429 water applied by pressure washer. Residual water within the slots
430 shall be vacuumed by use of a wet/dry vacuum. The slots shall then
431 be dried by air compressor. Flame torches shall not be used to dry
432 slots. After the slots are dried, any remaining debris stuck within the
433 slot must be removed. The slots must be completely clean and dry
434 before inserting the piezo sensors and lead-in cables.

435
436 **(j)** The slots shall be inspected before inserting piezo sensors.
437 If any additional debris or moisture is observed, compressed air
438 shall be used to dry the slots and remove any additional debris
439 before proceeding with installation.

440
441 **(k)** Piezo sensors shall be tested and cleaned prior to
442 installation according to manufacturer's installation instructions.

443
444 **(l)** Piezo sensors shall be laid in slots at 1-1/4 inch below the
445 surface of the roadway or as recommended by the manufacturer.
446 Piezo sensors shall be installed straight and flat in slots. Piezo
447 sensors shall be secured in place along the entire length of sensors
448 in slots by seating them in slots with the clips provided in the sensor
449 kit from the manufacturer. The clips shall be spaced 6 inches apart.

450
451 **(m)** Voids of the piezo sensor slots shall be filled with PU200
452 piezo installation resin (or equivalent) so that the piezo sensors are
453 fully encapsulated. The PU200 piezo installation resin (or
454 equivalent) shall be prepared in accordance with the manufacturer's
455 instructions and shall result in a finish approximately 1/16 inch
456 above the surface of pavement. Once the resin has sufficiently
457 hardened, the sealant shall be ground flush with the road surface
458 along the saw cut.

459

460
461
462
463
464
465
466
467
468
469
470
471
472
473
474
475
476
477
478
479
480
481
482
483
484
485
486
487
488
489
490
491
492
493
494
495
496
497
498
499
500
501
502
503
504
505

- (n) Hot tar shall not be used.
- (o) A service loop of 5 feet of extra slack shall be provided in pull boxes for each piezo lead cable.
- (p) Piezo lead cables shall be trimmed after allowing for an extra 12 inches of slack inside the EVC cabinet(s). Splicing to lengthen the piezo lead cable shall not be allowed under any condition. Spliced piezo lead cables will be rejected.
- (q) The in-road temperature sensor shall be installed according to the manufacturer's instructions, as approved by the Engineer. The temperature sensor shall be placed in a 3/8-inch wide by 2-inch deep slot at 1-1/4 inch below the road surface. The slot for the temperature sensor and its lead shall be cut by wet cutting, then cleaned and prepared in the same way as the slots for the piezo sensors.
- (r) Adequate power shall be provided for all test equipment to meet the detailed and specific requirements of the manufacturer for all tests required for certification and acceptance. All necessary equipment to perform the required tests shall be provided.
- (s) Traffic shall not be allowed on the completed system until the manufacturer's representative approves all conditions of the installation with the acceptance by the Engineer. Thereafter, testing in accordance with the manufacturer's requirements shall be completed before public traffic is allowed.
- (t) HDOT or its representative will make the final connection inside the EVC cabinet(s); however, the Contractor shall label the wires clearly to identify traffic direction, lane number, and sequence of piezo sensors in each lane per direction. All labeling at pull boxes and cabinet(s) must be consistent.

(2) Loop Sensors.

- (a) Construction shall reflect the number and configuration of loop sensors as shown in the Contract Plans.
- (b) Loop sensors and their leads shall be installed at least 18 inches away from cracks, potholes or joints within the pavement. If the finished pavement at the installation site has cracks, potholes or joints, the number and configuration of the loop sensors shall be modified.

506
507
508
509
510
511
512
513
514
515
516
517
518
519
520
521
522
523
524
525
526
527
528
529
530
531
532
533
534
535
536
537
538
539
540
541
542
543
544
545
546
547
548
549
550
551

(c) If the configuration of the loop sensors needs to be modified, the Contractor shall inform the State 14 days before construction and submit Shop Drawings of the revised configuration for approval.

(d) Loops shall be installed two per lane to measure speed and length of the vehicles and to classify vehicles in conjunction with the axle detectors (piezo sensors). Loops shall be installed such that they are centered in lanes relative to the final lane striping. Loop sensors not installed centered in each lane relative to the final lane striping shall be replaced correctly at no additional cost to the State. If lanes are less than 12 feet in width, the loop configuration may be specified as a non-centered configuration or otherwise modified. Refer to the configuration specified in the Contract Plans.

(e) A 3/8-inch thick blade shall be used to make 4-inch deep (or as shown on Contract Plans) slots for the loop sensors and their leads.

(f) Saw cuts shall be made by wet cutting. Dry cutting shall not be allowed.

(g) Dust, dirt, and refuse shall be cleaned away promptly after saw cutting is done. The slots shall be cleared by water applied by pressure washer. Residual water within the slots shall then be vacuumed using a wet/dry vacuum. The slots shall then be dried by air compressor. After the slots are dried, any debris stuck within the slot must be removed.

(h) The loop sensor and lead wire shall be one continuous piece of wire, from the pull box, to the loop, around it four turns, and back to the pull box. The size of loops is specified in the Contract Plans.

(i) After laying the four turns of loop sensor wire in the bottom of the 4-inch deep slot, 1-inch long pieces of backer rod shall be pressed down on top of the wires in each foot around the loop, to anchor the wires in the bottom of the slot before applying the loop sealant. Backer rod pieces shall also be placed on top of the loop leads as was done around the loops, to anchor the leads in the bottom of the collector slots that run from the loops to the conduit entry point at the edge of the pavement. Backer rod shall be embedded at least 2 inches below the top of pavement. The backer rod shall be placed into the slot with a blunt object, such as a wooden stir stick. No sharp object, such as a screwdriver, shall be used to press backer rod into slots.

552
553
554
555
556
557
558
559
560
561
562
563
564
565
566
567
568
569
570
571
572
573
574
575
576
577
578
579
580
581
582
583
584
585
586
587
588
589
590
591
592
593
594
595
596
597

(j) Loop sealant shall be applied to slots so that there are no voids, completely filling the slot, and such that the sealant will cure flush with the road surface.

(k) Twisted-pair loop leads shall be twisted five twists per foot from the conduit entry point at the roadside to the pull box, where they will be spliced to the home-run cable. The twisting shall be completed prior to inserting the resulting twisted-pair loop lead into the conduit leading to the pull box.

(l) A twisted pair of loop leads from one loop sensor shall not be twisted with the twisted pair from another loop sensor.

(m) The twisted-pair lead-in wires from the loop sensors shall be spliced (as directed by the Engineer) to new home-run cables at the closest pull box to the loop, using a splice kit. The splice kits shall be used in accordance with the manufacturer's specifications. The splices shall be inspected by the Engineer before acceptance. Splice points of cables must be suspended near the top of the pull box with a j-hook or equivalent.

(n) A service loop of 5 feet of extra slack shall be provided in pull boxes for each loop sensor home-run cable.

(o) Loop sensor home-run cables shall be trimmed after allowing for an extra 12 inches of slack inside the EVC cabinet(s).

(p) HDOT or its representative will make the final connection inside the EVC cabinet(s); however, the Contractor shall label the wires clearly to identify traffic direction, lane number, and sequence of loops sensors in each lane per direction. All labeling at pull boxes and cabinet(s) must be consistent.

(3) Pull Boxes.

(a) New pull boxes shall be furnished and installed as indicated in the Contract Plans. Locations for new pull boxes shall be excavated carefully. For station restorations, existing pull boxes are to remain and shall be reused when possible.

(b) New pull boxes shall be installed so that covers are level with curb or sidewalk grade or 1 inch above surrounding ground.

(4) Foundations.

598 (a) New foundations shall be constructed as indicated in the
599 Contract documents. Foundations within the Clear Zone, as defined
600 by the AASHTO *Roadside Design Guide*, including anchor bolts,
601 shall not extend more than 4 inches above the surrounding ground.
602 Pre-cast foundations, if used, shall also not extend more than 4
603 inches above the surrounding ground if located within the Clear
604 Zone.

605
606 (b) For cast-in-place foundations, forms shall be set true to
607 correct line and grade. Rigid forms shall be securely braced in
608 place. Conduit ends shall be placed in proper position and height
609 and held in place by rigid top template during concrete placement
610 and until concrete sets. Concrete shall be cured not less than 72
611 hours.

612
613 (c) Mixing, placement and curing of concrete for cast-in-place
614 foundations shall be in accordance with Section 601, 'Structural
615 Concrete' and Section 503, 'Concrete Structures' of the Standard
616 Specifications.

617
618 **(5) EVC Cabinet(s).**

619
620 New EVC cabinet(s) shall be mounted on foundation(s) and set at
621 required locations as shown in the Contract Plans or as ordered by
622 the Engineer. Cabinet(s) shall be secured to the foundation(s) with
623 1/2-inch by 4-1/2-inch stainless steel wedge anchors.

624
625 **(6) New Conduits.**

626
627 (a) New conduits shall drain towards pull boxes. Conduits shall
628 not drain towards the EVC cabinet(s).

629
630 (b) Directional changes in conduits, such as bends and changes
631 to clear obstructions, shall be made with curved segments using
632 accepted deflection couplings or with short lengths of straight
633 conduits and couplings. The deflection angle between two adjacent
634 lengths of conduits shall not exceed 6 degrees. The bends shall not
635 have a radius of less than 12 times the nominal size of the conduit.
636 The Contractor may use factory-made ells.

637
638 (c) Rigid PVC conduits shall be cut with a hacksaw. The ends
639 shall be squared and trimmed after cutting to remove rough edges.
640 The connections shall be of the solvent-weld type and be made
641 according to the conduit manufacturer's recommendations and as
642 accepted.
643

644 (d) Conduit ends shall be sealed with plugs at the end of each
645 day of work, whenever problems interrupt the conduit installation
646 work, and whenever conduits are subject to submergence in water.
647

648 (e) New conduits shall be kept clean during construction.
649

650 (f) Conduits under pavement and at utility crossings shall be
651 trenched and concrete encased, per Standard Plan TE-36. Metallic
652 Excavation Warning Tape shall be placed above the conduit per
653 Standard Plan TE-36. Conduits in some unpaved parts of the Right
654 of Way may be installed per Standard Plan TE-35, as indicated on
655 Contract Plans.
656

657 (g) Only hand shovels shall be used in compacting concrete
658 encasements. Concrete shall be cured for at least 72 hours before
659 permitting vehicular traffic to run over the concrete.
660

661 (h) The entire length of a conduit run between pull boxes or
662 between pull boxes and cabinets shall be of one type of material.
663

664 (i) The completed conduits shall be subject to a field test. A
665 bullet-shaped test mandrel about 14 inches long with a diameter
666 0.5 inch less than the inside diameter of the conduits shall be
667 passed through the entire length of each conduit run. The Engineer
668 will consider scouring found on the mandrel deeper than 1/32 inch
669 an indication of burrs and/or obstructions in the conduit run. Normal
670 abrasion between the conduit line and bottom of mandrel is not an
671 indication of burrs and/or obstructions in the conduit run. Any burrs
672 and/or obstructions shall be removed, then the test mandrel shall
673 be passed through again. The process shall be repeated until the
674 Contractor gets a satisfactory result.
675

676 (j) Each conduit run shall be provided with a No.10 gauge
677 flexible, zinc-coated pull wire (or 1/8-inch polyester or polyolefin pull
678 wire) extending through its entire length. An additional 5 feet of pull
679 wire shall be doubled back into the conduit at each end of the run.
680 Conduits and sleeves entering pull boxes shall be fitted with belled
681 ends and shall end flush in the wall with ends ground smooth and
682 plugged temporarily.
683

684 (7) **Existing Conduits.**
685

686 (a) For station restorations, existing conduits are to remain and
687 shall be reused if possible, after removal of existing wiring and any
688 accumulated dirt or debris.
689

690 (b) Each conduit run shall be provided with a No.10 gauge
691 flexible, zinc-coated pull wire (or 1/8-inch polyester or polyolefin pull
692 wire) extending through its entire length. An additional 5 feet of pull
693 wire shall be doubled back into the conduit at each end of the run.
694

695 (8) **New Wiring.**
696

697 (a) Wiring shall conform to the appropriate articles of the NEC
698 and shall be arranged within assemblies and pull boxes neatly.
699 Wiring installed underground must be in conduits—no direct burial.
700 Before the final installation of cables in conduits, a wire brush,
701 swab, and mandrel shall be pulled through each conduit, to ensure
702 that extraneous matter has been removed, and to verify that
703 the conduit system is clean and free from obstructions.
704

705 (b) Cables shall be handled with great care to avoid damage to
706 the conductors or the jacket. Cables shall not be pulled off and
707 laid on the ground before installation. Pulls shall be made in
708 one direction only. Lubricants used shall be as recommended
709 by the cable manufacturer or accepted by the Engineer. Wires or
710 cables shall not be left under tension nor tight against bushings or
711 fittings.
712

713 (c) Damaged ends resulting from the use of pulling grips shall be
714 removed soon after pulling conductor and cable. Cable ends shall be
715 temporarily taped or capped to exclude moisture and shall remain
716 protected until HDOT or its representative makes the final
717 connections inside the EVC cabinet(s). The Contractor shall label
718 the wires clearly to identify traffic direction, lane number, and
719 sequence of loops and piezo sensors in each lane per direction. All
720 labeling at pull boxes and cabinet(s) must be consistent.
721

722 (D) **Bonding and Grounding.** For station restorations, existing bonding and
723 grounding equipment shall remain and be reused when possible. New
724 stations shall have bonding and grounding constructed as follows:
725

726 (1) Metallic conductor and cable sheaths and conduits shall be secured
727 mechanically and electrically to form a continuous system.
728

729 (2) The system shall be grounded in accordance with the NEC and as
730 specified herein. No. 8 AWG copper wire or equivalent copper strap
731 of same cross-sectional area shall be provided for bonding and
732 grounding jumpers.
733

- 734
735
736
737
738
739
740
741
742
743
744
745
746
747
748
749
750
751
752
753
754
755
756
757
758
759
760
761
762
763
764
765
766
767
768
769
770
771
772
773
774
775
776
777
778
779
- (3) Conduits and neutral wires shall be grounded at service points as required in accordance with the NEC, using No. 6 AWG or equal for grounding conductors.
 - (4) Copper-clad steel or pure copper ground rod, 5/8-inch diameter by 8 feet long, shall be installed inside cabinet foundation(s).
 - (5) Grounding rods shall use No. 6 AWG wire to connect to No. 8 AWG ground wire loop and power system neutral.
 - (6) On wood poles, equipment mounted less than 8 feet above grade shall be grounded.
- (E) **Power Service.** New stations shall have necessary new power service facilities coordinated and constructed in accordance with the respective power company's requirements. For station restorations, existing power service equipment shall remain and be reused when possible.
- (F) **Wired Telecommunication Service.** If new EVC(s) will be using utility wired telecommunication service, the necessary new facilities shall be coordinated and constructed in accordance with the respective communications company's requirements. For station restorations, existing wired communication equipment shall remain and be reused when possible.
- (G) **Inspection and Testing.**
- (1) **Before Installation.** The equipment shall be given requisite factory tests and inspected by the contractor upon receipt to determine that the workmanship and materials are free from defects.
 - (2) **After Installation.**
 - (a) Piezo sensors shall be tested after installation. Hard copy and digital format test results shall be furnished for each piezo sensor, showing:
 - 1) Resistance: at least 1 megaohm.
 - 2) Capacitance: between 5 and 20 nanofarads.
 - 3) Dissipation Factor: less than 0.04.
 - (b) Loop sensors shall be tested after installation. Hard copy and digital format test results shall be furnished for each loop sensor, showing:

780
781
782
783
784
785
786
787
788
789
790
791
792
793
794
795
796
797
798
799
800
801
802
803
804
805
806
807
808
809
810
811
812
813
814
815
816
817
818
819
820
821
822
823
824
825

- 1) Induced voltage (V).
- 2) f = Frequency of Loop (kHz).
- 3) L = Inductance of Loop (μ H).
- 4) R = Resistance of Loop (ohm).
- 5) Meg Test = Loop insulation resistance should be greater than 100 megaohms.

(c) The Contractor shall provide all testing equipment such as BK 875A or equivalent LCR meter, Fluke 75 or higher/equivalent multimeter, megohmmeter, and scope meter or oscilloscope for the above tests.

(d) Any defects discovered as a result of the sensor tests shall be corrected at no additional cost to the State.

(3) Acceptance of EVC System(s). The EVC System(s) shall not be accepted and payment shall not be made until testing results requirements have been successfully met and the test results have been submitted to the State within 30 calendar days from the completion of sensor installation.

(H) Restoring Pavements and Other Improvements. Existing pavements and other improvements, such as driveways, sidewalks, curbs, and gutters disturbed by excavation shall be restored to their original condition. Replacement material equal to or better in quality than existing materials shall be used. Existing grades, thickness, texture, and color shall be matched whenever applicable.

(I) Warranty. New material and equipment for permanent construction shall be provided. Copies of manufacturer's warranty or warranties guaranteeing equipment free from defects in materials, design, and manufacturing, for not less than 12 months from the date of acceptance shall be furnished. Adjustment or repair of material and equipment under warranty shall be made within 24 hours from time of notification. Temporarily replacement of under-warranty material and equipment requiring factory corrections shall be made within 24 hours from time of notification. Factory-corrected or new material and equipment shall be installed no later than 30 days from time of notification.

621.04 Method of Measurement. The EVC System will be paid for on a lump sum basis. Measurement for payment will not apply.

826
827 **621.05 Basis of Payment.** The Engineer will pay for the accepted EVC System
828 on a lump sum basis. Payment will be full compensation for the work prescribed in this
829 section and the Contract Documents.

830
831 The Engineer will pay for the following pay item when included in the proposal schedule:
832

833 Pay Item	Pay Unit
834	
835 EVC System (Restore)	Lump Sum
836	
837 EVC System (New)	Lump Sum
838	

839 **END OF SECTION 621”**

1 **SECTION 622 – ROADWAY AND SIGN LIGHTING SYSTEM**
2

3 Make the following amendments to said Section:
4

5 **(I) Amend 622.04 Measurement** by revising lines 402 and 403 to read as follows:
6

7 **“622.04 Measurement.** The Engineer will measure the roadway and lighting system
8 items of various types per units described below in 622.05 Payment in accordance with
9 the contract documents.”
10

11 **(II) Amend 622.05 Payment** from lines 412 to 414 to read as follows:
12

13 **“622.05 Payment.** The Engineer will pay for the accepted roadway and lighting system
14 items of various types by the units described below. Payment will be full compensation
15 for the work described in this section and the contract documents.
16

17 The Engineer will pay for each of the following pay items when included in the proposal
18 schedule:
19

Pay Item	Pay Unit
22 State Street Light Standard, 98W LED, Luminaire, 23 8' Bracket Arm, Standard Pole, Base and Appurtenances	Each
25 State Street Light Standard, 98W LED Luminaire, 8' bracket arm, 26 18' Pole, grid node, base, and appurtenances.	Each
28 State Street Light Standard, 98W LED Luminaire, 8' bracket arm, 29 17' Pole, grid node, base, and appurtenances.	Each
31 State Street Light Standard, 120W LED, Luminaire, 32 8' Bracket Arm, Standard Pole, Base and Appurtenances	Each
34 State Street Light Standard, 120W LED Luminaire, 8' bracket arm, 35 25' Pole, grid node, base, and appurtenances.	Each
37 State Street Light Standard, 120W LED Luminaire, 8' bracket arm, 38 18' Pole, grid node, base, and appurtenances.	Each
40 State Street Light, 120 W LED, Mounted on HECO Wood Pole	Each
42 Street Light Metering Cabinet, pad, panelboard, meter socket and appurtenances	Each
44 GE Light Grid Node	Each
46 Type “B” Highway Lighting Pullboxes	Each

48	Streetlight Conductors, #RHW	L.F.
49		
50	Streetlight 2"C Pvc Sch 40	L.F.
51		
52	Street Light Trench Excavation	L.F.
53		
54	Street Light Concrete	C.Y.
55		
56	Remove Type "B" Streetlight Pull box	Each
57		
58	Remove Pole Mounted Streetlight, Bracket Arm, Luminaire, and Appurtenances	Each
59		
60	Remove Standalone Streetlight Base, 30' Pole, Bracket Arm,	Each
61	Luminaire, and Appurtenances	
62		
63	Remove Streetlight Ductbank	L.F.
64		
65	Remove Streetlight Cables	L.F.
66		
67	Allowance – HECO. Service Charge for Street Light Service	Lump Sum"
68		
69	END OF SECTION 622	

1 **SECTION 623 – TRAFFIC SIGNAL SYSTEM**

2
3 Make the following amendment to said Section:

4
5 **(I) Amend Section 623.04 - Measurement** by replacing lines 578 to 579 to
6 read:

7
8 **“623.04 Measurement.** The Engineer will not measure software for
9 controller, interconnect, or electrical risers for payment.

10
11 (A) The Engineer will measure the controller assembly, foundation for
12 traffic signal controller, traffic signal standard, foundation for traffic
13 signal standard, pedestrian or traffic signal assembly, pedestrian
14 pushbutton, pullbox, loop detector sensing unit, emergency vehicle
15 preemption optical receiver, service and metering equipment
16 assembly, and advance warning beacon assembly per each in
17 accordance with the contract documents.

18
19 (B) The Engineer will measure camera cable, traffic signal interconnect
20 subduct, traffic signal ductline, secondary electrical ductline and
21 conductors per linear foot in accordance with the contract documents.

22
23 (C) Hawaiian Electric Company service connection fees for traffic signal
24 service will be paid on a lump sum basis. Measurement for payment
25 will not apply.

26
27
28 **(II) Amend Section 623.05 – Payment** by replacing lines 581 to 594 to read:

29
30 **“623.05 Payment.** The Engineer will pay for the controller assembly at the
31 contract unit price per each complete in place. The price includes full
32 compensation for submitting the equipment list and drawing; furnishing and
33 mounting the controller cabinet; furnishing, assembling, wiring, software, and
34 housing the controller and auxiliary equipment; painting the controller cabinet;
35 testing; providing turn-on service; submitting warranty; and furnishing equipment,
36 tools, labor, materials and other incidentals necessary to complete the work.
37 Conduits and cables up to 10’ away from the controller assembly are considered
38 incidental to the installation of the controller assembly.

39
40 The Engineer will pay for the traffic signal standard at the contract unit
41 price per each complete in place. The price includes full compensation for
42 submitting the equipment list and drawing; furnishing and installing the traffic
43 signal standard; wiring; bonding and grounding; testing; providing turn-on
44 service; submitting warranty; and furnishing equipment, tools, labor, materials;
45 and other incidentals necessary to complete the work. Conduits and cables up to
46 10’ away from the traffic signal standards are considered incidental to the
47 installation of the traffic signal standard.

48

49 The Engineer will pay for the traffic signal assembly installed on street
50 light standards at the contract unit price per each complete in place. The price
51 includes full compensation for submitting the equipment list and drawing;
52 furnishing and installing the traffic signal standard; wiring; bonding and
53 grounding; testing; providing turn-on service; submitting warranty; and furnishing
54 equipment, tools, labor, materials; and other incidentals necessary to complete
55 the work. Conduits and cables up to 10' away from the street light standards are
56 considered incidental to the installation of the traffic signal assembly.

57

58 The Engineer will pay for the foundation for controller cabinet and traffic
59 signal standard at the contract unit price per each complete in place. The price
60 includes full compensation for excavating and backfilling; forming; furnishing and
61 placing the reinforcing steel; mixing, placing, and curing the concrete; furnishing
62 and setting the anchor bolts; restoring the pavement; construction of a raised
63 concrete pedestal; and furnishing equipment, tools, materials and other
64 incidentals necessary to complete the work. Conduits and cables up to 10' away
65 from the traffic signal standards are considered incidental to the installation of the
66 traffic signal standard.

67

68 The Engineer will pay for the pedestrian and traffic signal assembly at the
69 contract unit price per each complete in place. The price includes full
70 compensation for submitting the equipment list and drawing; assembling the
71 signal heads; wiring; bonding and grounding; painting the signal head mounting;
72 testing; providing turn-on service; submitting warranty; and furnishing equipment,
73 tools, labor, materials and other incidentals necessary to complete the work.

74

75 The Engineer will pay for the pedestrian pushbutton with instruction sign at
76 the contract unit price per each complete in place. The price includes full
77 compensation for submitting the equipment list and drawing; furnishing and
78 installing the pedestrian pushbutton with the instruction sign; wiring; bonding and
79 grounding; testing; providing turn-on service; submitting warranty; and furnishing
80 equipment, tools, labor, materials; and other incidentals necessary to complete
81 the work.

82

83 The Engineer will pay for the pullbox at the contract unit price per each
84 complete in place. The price includes full compensation for submitting the
85 equipment list and drawing; furnishing and installing the pullbox at the designated
86 locations; saw cutting; excavating and backfilling; restoration of concrete
87 sidewalks, asphalt concrete pavement and landscaping; coating the frames and
88 covers; and furnishing equipment, tools, labor, materials and other incidentals
89 necessary to complete the work.

90

91 The Engineer will pay for the loop detector sensing unit at the contract unit
92 price per each complete in place. The price includes full compensation for saw
93 cutting; cleaning and blowing the saw cut areas; furnishing and inserting the loop
94 cable; splicing in the pullbox; filling the saw cut groove with epoxy sealer or hot

95 applied rubberized sealant; and furnishing equipment, tools, labor, materials and
96 other incidentals necessary to complete the work.

97
98 The Engineer will not pay for the interconnect or electrical risers. The
99 work includes furnishing and installing the riser; and furnishing equipment, tools,
100 labor, materials, and other incidentals necessary to complete the work. The
101 Engineer will consider the cost for risers as included in the contract price for the
102 various contract items.

103
104 The Engineer will pay for the emergency vehicle preemption (EVP) optical
105 receiver at the contract unit price per each complete in place. The price includes
106 full compensation for submitting the equipment list and drawing; furnishing and
107 installing the EVP; wiring; bonding and grounding; testing; providing turn-on
108 service; submitting warranty; and furnishing equipment, tools, labor, materials;
109 and other incidentals necessary to complete the work.

110
111 The Engineer will pay for the camera cable at the contract unit price per
112 linear foot complete in place. The price includes full compensation for furnishing
113 and installing the preemption detector cable from the detector to the cabinet; and
114 furnishing equipment, tools, labor, materials and other incidentals necessary to
115 complete the work.

116
117 The Engineer will pay for the traffic signal ductlines at the contract unit
118 price per linear foot complete in place. The price includes full compensation for
119 saw cutting; trenching; excavating and backfilling, including asphalt concrete
120 pavement, aggregate base course and aggregate subbase course for trench
121 repair; concrete curb and/or gutter, concrete sidewalk repair and striping
122 restoration; furnishing, installing, bonding, and grounding the conduits and
123 interconnect subducts; and furnishing equipment, tools, labor, materials and
124 other incidentals necessary to complete the work.

125
126 The Engineer will pay for the traffic signal interconnect subduct at the
127 contract unit price per linear foot complete in place. The price includes full
128 compensation for furnishing and installing; and furnishing equipment, tools, labor,
129 materials and other incidentals necessary to complete the work.

130
131 The Engineer will pay for the traffic signal cables at the contract unit price
132 per linear foot complete in place. The price includes full compensation for
133 furnishing, installing, splicing, and taping the cable; furnishing and installing
134 interconnect fabric subducts; making the connections; providing turn-on service;
135 and furnishing equipment, tools, labor, materials and other incidentals necessary
136 to complete the work.

137
138 The Engineer will pay for the service and metering equipment assembly at
139 the contract unit price per each complete in place. The price includes full
140 compensation for furnishing and installing the meter/main safety socket box,
141 pullbox, support structure, ground rod, conduit, conductors; and furnishing

142 equipment, tools, labor, materials and other incidentals necessary to complete
143 the work.

144
145 The Engineer will pay for Hawaiian Electric Company service connection
146 fees and transformer installation on a force account basis according to
147 Subsection 109.06 – Force Account Provisions and Compensation. An estimate
148 amount for the force account is allocated in the proposal schedule under
149 Hawaiian Electric Company Service Connection Fees and Transformer
150 Installation Fees. The actual amount to be paid will be the sum shown on the
151 accepted force account records whether this sum be more or less than the
152 estimated amount allocated in the proposal schedule.

153
154 The Engineer will pay for traffic signal pullboxes at the contract unit price
155 per each complete in place. The price includes full compensation for furnishing
156 and installing the pullbox, and furnishing equipment, tools, labor, materials and
157 other incidentals necessary to complete the work.

158
159 The Engineer will pay for traffic signal pullbox tie-in at the contract unit
160 price per each complete in place. The price includes full compensation for
161 furnishing and installing the pullbox tie-in, and furnishing equipment, tools, labor,
162 materials and other incidentals necessary to complete the work.

163
164 The Engineer will pay for the secondary electrical ductline at the contract
165 price per linear foot complete in place. The price includes full compensation for
166 saw cutting, excavating and backfilling; furnishing, installing, grounding,
167 terminating conductors; and furnishing equipment, tools, labor, materials and
168 other incidentals necessary to complete the work.

169
170 The Engineer will consider full compensation for additional materials and
171 labor not shown in the contract that are necessary to complete the installation of
172 the various systems incidental to the various contract items. The Engineer will
173 not allow additional compensation.

174
175 The Engineer will pay for the traffic signal assembly at the contract unit
176 price per each complete in place. The price includes full compensation for
177 submitting the equipment list and drawing; furnishing and installing the signal
178 assembly; wiring; bonding and grounding; testing; providing turn-on service;
179 submitting warranty; and furnishing equipment, tools, labor, materials; and other
180 incidentals necessary to complete the work. Wiring from the traffic signal mast
181 arm or pole to the handhole are considered incidental to the traffic signal
182 assembly.

183
184 The Engineer will pay for the Closed-Circuit Television Camera (CCTV) at
185 the contract unit price per each complete in place. The price includes full
186 compensation for submitting the equipment list and drawing; furnishing and
187 installing the CCTV camera; wiring; bonding and grounding; testing; providing

188 turn-on service; submitting warranty; and furnishing equipment, tools, labor,
189 materials; and other incidentals necessary to complete the work.

190
191 The Engineer will pay for the penetration of existing pullbox at the contract
192 unit price per each complete in place. The price includes full compensation for
193 furnishing and installing conduits and ends incidental to the penetration; wiring;
194 bonding and grounding; testing; finishing; submitting warranty; and furnishing
195 equipment, tools, labor, materials; and other incidentals necessary to complete
196 the work.

197
198 The Engineer will pay for saw cutting, excavation, backfill and restoration
199 of the traffic signal ductlines at the contract unit price complete in place. The
200 price includes full compensation for saw cutting; trenching; excavating and
201 backfilling, including asphalt concrete pavement, aggregate base course and
202 aggregate subbase course for trench repair; concrete curb and/or gutter and
203 concrete sidewalk repair; and furnishing equipment, tools, labor, materials and
204 other incidentals necessary to complete the work.

205
206 The Engineer will pay for the following pay items when included in the
207 proposal schedule:

208		
209	Pay Item	Pay Unit
210	Traffic Signal Cabinet and Foundation	Each
211		
212	Type I Traffic Signal Standard _____ with conduit & Cabling	Each
213		
214	Type II Traffic Signal Standard _____ with conduit & Cabling	Each
215		
216	Street Light Traffic Signal Standard	Each”
217		
218	Traffic Signal Assembly _____ with Cabling	Each
219		
220	Traffic Signal Assembly _____ Programmed Visibility	Each
221		
222	Pedestrian Pushbutton with Instruction Sign with Cabling	Each
223		
224	Pedestrian Signal Assembly _____ with Cabling	Each
225		
226	Type “A” Pullbox	Each
227		
228	Type “B” Pullbox	Each
229		
230	Type “C” Pullbox	Each
231		
232	Pullbox Tie-in	Each
233		
234	Loop Detector Sensing Unit (6 Ft. x 6 Ft.) with Cabling	Each

235		
236	EVP Optical Receiver	Each
237		
238	EVP Optical Receiver Cabling	Lin.Ft.
239		
240	Traffic Signal Ductline _____	Lin. Ft.
241		
242	Type 1 Cable – 26C#14	Lin. Ft.
243		
244	Type 2 Cable – 2C#14	Lin. Ft.
245		
246	Type 6 Cable – Electrical Service Cable	Lin. Ft.
247		
248	Demolish _____	Lump Sum
249		
250	Service and Metering Equipment Assembly	Each
251		
252	Allowance – HEC Co. Service Charge for Traffic Signal Service	Lump Sum”
253		
254	END OF SECTION 623	

1 **SECTION 624 – WATER SYSTEM**

2
3 Make the following amendments to said Section:

4
5 **(I)** Amend **624.04 – Measurement** by revising lines 587 to 588 to read as
6 follows:

7
8 **“624.04 Measurement.**

9
10 **(A)** The Engineer will measure ductile iron pipe per linear foot, inclusive
11 of all fittings, special castings, and all appurtenances in accordance
12 with Contract Documents.

13
14 **(B)** The Engineer will measure bevel geared gate valves, gate valves,
15 air relief valves (ARV), water service laterals, and fire hydrants,
16 inclusive of all fittings, special castings, and all appurtenances per
17 each in accordance with Contract Documents.

18
19 **(C)** Cathodic protection will be paid on a lump sum basis.
20 Measurement for payment will not apply.

21
22 **(D)** The Engineer will measure connection to existing waterlines,
23 inclusive of all fittings, special castings, and all appurtenances per
24 each in accordance with the Contract Documents.

25
26 **(E)** Temporary Waterline By-pass will be paid on a lump sum basis.
27 Measurement for payment will not apply.”

28
29 **(II)** Amend **624.05 – Payment** by revising lines 589 to 596 to read as follows:

30
31 **“624.05 Payment.** The Engineer will pay for the accepted pay items listed
32 below at the contract price per pay unit, as shown in the proposal schedule.
33 Payment will be full compensation for the work prescribed in this section and
34 contract documents.

35
36 The Engineer will pay for each of the following pay items when included in
37 the proposal schedule:

Pay Item	Pay Unit
_____ - Inch Ductile Iron Pipe, Class 53	Linear Foot
_____ - Inch Bevel Geared Gate Valve	Each
_____ - Inch Gate Valve	Each
_____ - Inch Offset ARV	Each

48		
49	Type _____ Water Service Lateral	Each
50		
51	Fire Hydrant	Each
52		
53	Cathodic Protection	Lump Sum
54		
55	Temporary Waterline By-Pass _____	Lump Sum”
56		
57		
58		
59		
60		
61		
62		

END OF SECTION 624

1 **SECTION 625 – SEWER SYSTEM**
2

3 Make the following amendments to said Section:
4

5 **(I)** Amend **625.04 – Measurement** by revising lines 487 to 488 to read as
6 follows:
7

8 **“625.04 Measurement.**

9
10 **(A)** The Engineer will measure the PVC for Sewer System, inclusive of
11 all fittings and all appurtenances, on a linear foot basis in
12 accordance with Contract Documents.
13

14 **(II)** Amend **625.05 – Payment** by revising lines 494 to 496 to read as follows:
15

16 **“624.05 Payment.** The Engineer will pay for the accepted pay items listed
17 below at the contract price per pay unit, as shown in the proposal schedule.
18 Payment will be full compensation for the work prescribed in this section and
19 contract documents.
20

21 The Engineer will pay for each of the following pay items when included in
22 the proposal schedule:
23

Pay Item	Pay Unit
_____ - Inch PVC for Sewer System	Linear Foot”

24
25
26
27
28
29
30 **END OF SECTION 625**
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47

1 **SECTION 626 – MANHOLES AND VALVE BOXES FOR WATER AND SEWER**
2 **SYSTEMS**

3
4 Make the following amendment to said Section:

5
6 **(I) Amend 626.04 - Measurement** by replacing lines 172 to 173 to read:

7
8 **“626.04 Measurement.** The Engineer will measure manholes and valve
9 boxes, inclusive of frames and covers per each for water and sewer systems.”

10
11 **(II) Amend 626.05 – Payment** by revising lines 174 to 192 to read as follows:

12
13 **“626.05 Payment.** The Engineer will pay for the accepted pay items listed
14 below on a per each basis, as shown in proposal schedule. Payment will be full
15 compensation for work prescribed in this section and in contract documents.

16
17 The Engineer will pay for each of the following pay items when included in
18 proposal schedule:

19

20 Pay Item	21 Pay Unit
22 Type ____ Meter Box	23 Each
24 ____ Manhole, ____ feet to ____ feet	25 Each
26 Reconstructing _____ Manhole, _____ feet to _____ feet	27 Each
28 Adjusting _____ Manhole Frame and Cover	29 Each
30 (_____) Standard Valve Box	31 Each
32 Adjusting (_____) Standard Valve Box	33 Each

34 The Engineer will pay for excavation and backfill in accordance with and
35 under Section 204 -- Excavation and Backfill for Miscellaneous Facilities.”

36
37
38
39 **END OF SECTION 626**

SECTION 629 - PAVEMENT MARKINGS

Make the following amendments to said Section:

(I) Amend **Subsection 629.03(B) – Temporary Pavement Markings** by revising the third paragraph from line 62 to 63 to read:

“Maintain and replace temporary pavement markings, flexible delineators, and barricades. ”

(II) Amend **Table 629.03 – 1 – Temporary Pavement Markings** to read as follows:

“TABLE 629.03-1 TEMPORARY PAVEMENT MARKINGS	
TYPE	PAVEMENT MARKINGS
Passing Permitted - Both Sides	Single 4-inch yellow stripe 5 feet in length spaced 20 feet on center with Type D markers spaced 40 feet on center and located on center of 5-foot length of stripe.
Passing Prohibited - Both Sides	Double solid 4-inch yellow stripes with Type D markers placed 20 feet on center on one of 4-inch yellow stripes selected by the Engineer.
Passing Permitted - One Side Only	Single continuous 4-inch yellow stripe with Type D markers placed on stripe 20 feet on center on no-passing side and single 4-inch yellow stripes 5 feet in length spaced 20 feet on center on passing side.
Lane Lines - Lane Changing Permitted	Single 4-inch yellow or white stripe 5 feet in length spaced 20 feet on center with Type C or Type D markers spaced 40 feet on center.
Lane Lines - Lane Changing Prohibited	Double solid 4-inch white stripes with Type C markers placed 20 feet on center on one of the 4-inch white stripes selected by the Engineer.
Crosswalk	Two 12-inch white transverse lines spaced 8 feet on center or as ordered by the Engineer.
Stop Line	Single 12-inch white transverse line.
Note: Paint may be used for temporary markings in areas where final paving is not complete.”	

(III) Amend Subsection 629.03 – Construction by adding the following paragraphs after line 236:

19 “(c) **Profiled Thermoplastic** Profiled thermoplastic markings
20 shall be produced in one continuous integral process consisting of
21 an extruded base line with raised ribs positioned at regular and
22 predetermined intervals. The product shall be available in standard
23 widths and standard colors of white and yellow.
24

25 The base line shall consist of thermoplastic materials extruded to a
26 thickness of not less than 100 mils nor more than 125 mils. The
27 width of the line shall be in accordance with the plans. The edges
28 of the lines shall be well defined and free from waviness.
29

30 The raised ribs shall be positioned at regular 36 inch intervals when
31 measure center to center. The general shape of the ribs
32 approximates a trapezoid when viewed from a profile aspect. The
33 raised rib shall stand a minimum of 400 mils above the extruded
34 base line. The length of the raised rib shall be a minimum of 2.5
35 inches measured at the widest portion of the crown of the rib. In
36 addition, the ribs shall be approximately rectangular in shape.
37

38 **(IV)** Amend **629.04 – Measurement** by revising lines 292 to 294 to read as
39 follows:
40

41 **“629.04 Measurement.**

42
43 (A) The Engineer will measure profiled thermoplastic, thermoplastic and
44 preformed pavement marking tape per linear foot in accordance with
45 the contract documents. The longitudinal pavement markings will be
46 measured per linear foot as a single stripe for the width specified in the
47 contract and in the proposal. The Engineer will include the longitudinal
48 gaps for skip striping, up to thirty (30) feet long, in the measurement.
49

50 The Engineer will measure the crosswalk markings per lane,
51 according to the contract documents. Lanes shall include travel lanes,
52 bike lanes, and auxiliary lanes.
53

54 The Engineer will not measure temporary pavement markings
55 including flexible delineator posts with reflector markers or Type I
56 Barricades and temporary signs installed for the longitudinal guidance
57 of public traffic over reconstructed areas, cold planed surfaces, newly
58 paved surfaces or other unmarked or scarified areas for payment.
59

60 The Engineer will measure the temporary pavement markings and
61 temporary signs installed as ordered by the Engineer for special
62 temporary traffic patterns on a force account basis, if the contract
63 specifies payment in the proposal.
64

65 The Contractor shall consider the work required for the removal of
66 pavement markings incidental to the various contract items, except as
67 provided in the proposal or elsewhere in the contract. If the contract
68 stipulates that the Engineer will make payment for the removal of
69 pavement markings, the Engineer will measure the removal of
70 pavement markings.

71
72 (B) The Engineer will measure the pavement markers per each for the
73 types shown in the proposal.”

74
75 (V) Amend **629.05 – Payment** by revising lines 296 to 330 to read as follows:

76
77 **“629.05 Payment.**

78
79 (A) The Engineer will pay for profiled thermoplastic, thermoplastic and
80 preformed pavement marking tape at the contract price per linear foot
81 according to the contract, complete in place, including primers.

82
83 The Engineer will pay for double four (4) inch striping with a four (4)
84 inch space between stripes at the contract price per linear foot
85 according to the contract.

86
87 The Engineer will pay for crosswalk markings at the contract price
88 per lane of traffic marked, according to the contract.

89
90 The Engineer will pay for pavement arrows (single and multiple
91 heads), symbols, and words at the contract price per each according to
92 the contract.

93
94 The contract unit price paid shall be full compensation for furnishing
95 labors, materials, tools, equipment and incidentals and for doing the
96 work involved in furnishing and installing pavement markings complete
97 in place according to the contract.

98
99 The Engineer will not pay for the temporary pavement markings
100 including flexible delineator posts with reflector markers or Type I
101 Barricades and temporary signs installed for the longitudinal guidance
102 of public traffic over reconstructed areas, cold planed surfaces, newly
103 paved surfaces or other unmarked or scarified areas for payment if not
104 shown in the proposal separately. The Engineer will consider them
105 incidental to the various contract items.

106
107 If the contract specifies payment for temporary pavement markings
108 installed as ordered by the Engineer for special temporary traffic
109 patterns, the Engineer will pay from an allowance for “Temporary
110 Construction Zone Markings”.

112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148

The Engineer will compute the actual amount paid to the Contractor for force account work according to Subsection 109.06 – Force Account Provisions and Compensation.

If the contract specifies payment for removal of pavement markings under unit price pay items, the Engineer will pay for the accepted quantities at the contract unit prices bid. The prices shall be full compensation for removing such items according to the contract.

(B) The Engineer will pay for the various types of pavement markers at the contract price per each according to the contract, complete in place, including adhesives.

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

Pay Item	Pay Unit
Profiled Thermoplastic Striping	Linear Foot
_____ - Inch Pavement Striping (Thermoplastic)	Linear Foot
Crosswalk Marking (Thermoplastic)	Lane
Pavement Arrow (Thermoplastic)	Each
Pavement Word (Thermoplastic)	Each
Pavement Symbol (Thermoplastic)	Each
Type _____ Pavement Marker	Each
Temporary Construction Zone Markings	Force Account"

END OF SECTION 629

48	_____ Sign	Each
49		
50	Relocation of Existing _____ Sign	Each”
51		
52		
53		
54		
55		

END OF SECTION 631

1 **SECTION 634 – PORTLAND CEMENT CONCRETE SIDEWALKS**

2
3 Make the following amendment to said Section:

4
5 **(I) Amend Section 634.02 - Materials** by replacing line 8 to read:

6
7 “Macro-Synthetic Fibers for Concrete Sidewalk Reinforcement 720”

8
9 **(II) Amend Section 634.03 - Construction** by replacing lines 21 to 22 to read:

10
11 **“(D) Reinforcement.** Provide macro-synthetic fibers for concrete sidewalk
12 reinforcement, in accordance with Section 720 - Macro-Synthetic Fibers for
13 Concrete Sidewalk Reinforcement.”

14
15 **(III) Amend Section 634.04 - Measurement** by replacing lines 60 to 61 to read:

16
17 **“634.04 Measurement.**

18
19 **(A)** The Engineer will measure Portland cement concrete sidewalks per
20 square yard in accordance with the Contract Documents.

21
22 **(B)** The Engineer will not pay for Untreated Aggregate Bed Course
23 under Portland cement concrete sidewalks separately. The Engineer will
24 consider the cost for Untreated Aggregate Bed Course under Portland
25 cement concrete sidewalks as included in the contract price of the Portland
26 cement concrete sidewalks.”

27
28 **(C)** The Engineer will not pay for joints separately. The Engineer will
29 consider the cost for all joint work as included in the contract price of the
30 Portland cement concrete sidewalks.

31
32 **(D)** The Engineer will not pay for reinforcement separately. The
33 Engineer will consider the cost for all reinforcement work as included in the
34 contract price of the Portland cement concrete sidewalks.”

35
36 **(IV) Amend Section 634.05 – Payment** by replacing lines 62 to 72 to read:

37
38 **“634.05 Payment.** The Engineer will pay for the accepted pay items listed
39 below at the contract price per pay unit, as shown in the proposal schedule.
40 Payment will be full compensation for all the work prescribed in this section and
41 the contract documents.

42
43 The Engineer will pay for each of the following pay items when included in
44 the proposal schedule:

48	Pay Item	Pay Unit
49		
50	Portland Cement Concrete Sidewalk	Square Yard

51

52 The Engineer will pay for excavation of unsuitable material and backfill

53 with material acceptable to the Engineer under Section 203 – Excavation and

54 Embankment. If no pay item exists, refer to Subsection 104.02 – Changes.”

55

56

57

58

END OF SECTION 634

1 Make the following Section a part of the Standard Specifications:
2

3 **“SECTION 635 – E-CONSTRUCTION**
4

5
6 **635.01 Description.** This section specifies requirements for performing the
7 Project in a “paperless” manner, using electronic tools for all submittals,
8 communications, quantity tracking, testing, and sampling, scheduling, quality
9 control, and performance monitoring.
10

11 **635.02 General Requirements.** The Contractor shall acquire a license for and
12 implement the use of the E-Construction platform(s) designated by HDOT
13 throughout the project. Paper-based or hard copy submittals will not be accepted.
14

15 This Special Provision shall take precedence over all other Specification
16 sections with respect to providing and receiving paper copy communications,
17 submittals, and any project records. Where conflicts exist, and a decision between
18 a hard-copy item and a corresponding electronic version is needed, the electronic
19 version shall be selected, unless otherwise directed by the Engineer.
20

21 **635.03 Construction**
22

23 **(A) Plans and Specifications.** Project drawings will not be provided to
24 the Contractor in hard copy format. An electronic version will be provided
25 in the E-Construction platform for use during the project.
26

27 The Contractor shall note all changes to the work, including all
28 subcontractor’s work, in electronic format using the E-Construction
29 platform. Red annotations shall be used to note changes. Blue annotations
30 shall be used for any additional notes that will be helpful for the State in
31 interpreting the field posted drawings. Other drafting standards may be
32 implemented by the Engineer and shall be adhered to by the Contractor.
33 Changes shall be input by the Contractor and reviewed by the Engineer
34 monthly. The Contractor shall make any changes that the Engineer
35 requires.
36

37 **(B) Submittals.** The Contractor shall provide all required submittals, as
38 listed within the contract documents, via the E-Construction platform. All
39 review, approval, and resubmittal regarding submittals shall also be
40 documented within the E-Construction platform.
41

42 **(C) Correspondence.** Electronic mail (email) shall be the preferred
43 method of electronic communication. All communications that affect project
44 scope, schedule, cost, or quality, including changes and requests for
45 information, shall be submitted in the E-Construction platform.
46

47 **(D) Prosecution and Progress.** The Contractor shall provide all
48 administrative, management, and project support documents required by
49 various specification sections, using the E-Construction platform. These
50 elements include, but are not limited to:

- 51
- 52 (1) Preconstruction Submittals (Section 108.03 – Pre-
53 Construction Data Submittal)
- 54 (2) Correspondence regarding Contract Time (Section 108.05)
- 55 (3) Progress Schedules (Section 108.06)
- 56 (4) Weekly Meeting preparatory materials (Section 108.07)
- 57 (5) Samples, certifications, material data, installation instructions,
58 and shop drawings (Sections 105 – Control of Work and 106 –
59 Material Restrictions and Requirements)
- 60 (6) Field-posted Drawings (Section 648)
- 61 (7) Pre-Final Inspection submittals (Section 108.13 – Pre-Final
62 and Final Inspection)
- 63 (8) Warranty documentation (Section 108.17 – Guarantee of
64 Work)
- 65 (9) Project Closing Documents (Section 108.19 – Final
66 Settlement of Contract)
- 67

68 In addition to the foregoing, the Contractor shall provide any
69 other materials, correspondence, and submittals using the E-
70 Construction platform, when directed by the Engineer.

71

72 **(E) Resources.** The Contractor shall provide a comprehensive list of
73 Contractor labor and equipment, including all subcontractor labor and
74 equipment, that will be deployed on the project, using spreadsheet-based
75 templates provided in the E-Construction platform. All template fields shall
76 be completed. The submitted information shall comply with the
77 requirements of Specification Section 108 (identification of labor and
78 equipment resources) and Specification Section 109 (cost data) and
79 represent all individual personnel with labor categories and rates, and all
80 equipment owned or rented, with associated rates, on this project. Updates
81 for additional personnel or equipment shall be accomplished by the
82 Contractor at will and shall be completed when directed by the Engineer.

83

84 **635.04 Measurement.** The Engineer will measure the fee for the license(s)
85 associated with the “E-Construction Program” on a force account basis in
86 accordance with Subsection 109.06 – Force Account Provisions and
87 Compensation.

88

89 There will be no additional compensation for implementation or use of the
90 E-Construction platform in compliance with the requirements herein.

91

92 The Engineer may withhold progress payment until the Contractor is in
93 compliance with all E-Construction requirements.

94
95 **635.05 Payment.** The Engineer will pay for the fee for the license(s) for the E-
96 construction Program on a force account basis in accordance with Subsection
97 109.06 – Force Account Provisions and Compensation. Payment will be full
98 compensation for the “E-Construction” licensing fee as prescribed in this section
99 and contract documents. The actual amount to be paid will be the sum shown on
100 the accepted force account records whether this sum be more or less than the
101 estimated amount allocated in the proposal schedule.”

Pay Item	Pay Unit
E-Construction license(s)	Force Account

102
103
104
105
106
107
108
109
110
END SECTION 635

1 Make the following section part of the Standard Specifications:
2

3 **"SECTION 636 – TRAFFIC MONITORING AND SIGNAL CONTROL SYSTEM**
4

5 **636.01 Description.** This section shall consist of all work and materials necessary to
6 complete a fully operational CCTV and signal control system for traffic control and
7 surveillance of various sites shown on the plans. The work shall involve coordinating all
8 equipment and labor necessary to incorporate and integrate the new upgraded digital
9 CCTV sites into Honolulu's existing Pelco CCTV master system, using Internet Protocol
10 (IP) based communications, located at the Joint Traffic Management Center (JTMC) at
11 710 South King Street. The expanded CCTV and signal control system will assist
12 operators at the JTMC to monitor traffic conditions, mitigate traffic congestion, and set
13 the appropriate traffic plans which best suits and improves the traffic progression along
14 Honolulu's busiest arterials.
15

16 The CCTV and signal control system shall consist of remotely controlled color cameras,
17 remote video switching, IP communications system, and a fiber optic link. From camera
18 sites to a central gigabit switch, video signals and control data will be transmitted over
19 two single-mode fibers by an IP video encoder, a serial to IP data converter and a
20 10/100base T/FX IP switch. At several of the central gigabit switch's 100base FX bi-
21 directional channels, data and video from all of the cameras and traffic signals on site
22 Ethernet switch will be connected. The linear add-drop network architecture shall be
23 used for the connection between the CCTV camera's on-site switches and the central
24 gigabit switch. The central gigabit switch shall be connected to the JTMC's gigabit
25 switch through a 1000Base FX channel using two single mode fiber optic cables. From
26 the JTMC's gigabit switch, IP video decoders, one for each camera site, shall be used
27 to connect to the existing Pelco switcher.
28

29 All camera equipment shall be identical and/or compatible with the existing Honolulu
30 system in terms of hardware and software.
31

32 There shall be a locally based supplier of the CCTV system and fiberoptic hardware
33 who shall have at least 3 (three) years experience from the project advertisement in
34 installing and setting up of CCTV and fiberoptic systems over \$200,000 specifically for
35 traffic-highway applications. The CCTV firm shall be responsible for testing all fiberoptic
36 hardware and cables to provide a documented optical budget loss analysis for each link
37 to and from a hub station. The CCTV supplier will be responsible for all hookup,
38 assignments, dedication, testing, matching, and splicing of the fiberoptic cables. All
39 fiberoptic splice points shall be spliced color-for-color whenever matching pairs are
40 available. Pigtails on all fiberoptic members which attach to fiberoptic hardware and
41 components with SC-connectors. The CCTV supplier shall be fully responsible for all
42 splices, budget loss, attenuators, appropriate fiber hardware, accessories, and pigtail
43 connections for a fully operational system. All other hardware, equipment, and labor
44 necessary shall be considered incidental.
45

46 The Fiberoptic Cable Contractor shall be a locally based installer who shall have at least
47 3 (three) years experience from the project advertisement in installing fiberoptic cables
48 over \$250,000 specifically for outdoor overhead joint-pole and underground
49 applications. The firm shall also track and document the installation data and tension
50 measurements when installing the fiberoptic cables. Any tension measurements which
51 exceeds the manufacturer's recommendations will be considered means for the cable
52 rejection. The Fiberoptic Contractor shall be fully responsible for the quality and
53 integrity of the installed cable and the operability of the final fiberoptic cable product.
54

55 **636.02 Video, Signal Control and Fiberoptic Hardware.** For bidding purposes, the
56 qualified, as stated in Section 636.01 Description, CCTV Supplier shall furnish and
57 install the following items and quantity. All other equipment necessary to complete a
58 fully operational system will be considered incidental.
59

60 **(A) Interconnected Signals Site Equipment.** In order to communicate with the
61 JTMC over an Ethernet network, a 170E controller will need an Ethernet module.
62 The Ethernet module shall enable any 170E controller to communicate over an
63 Ethernet network. The Ethernet module shall be designed to plug into the
64 modem slot of the 170E controller. Communication to the controller is through
65 the EIA-232 serial port lines while the RJ-45 connector supports the Ethernet
66 interface. The module shall be auto sensing for either 10Base-T or 100Base-T.
67 The Ethernet module shall process the Ethernet protocol packet such that the
68 170E Signal controller only sees the intended message.
69

70 The Contractor shall at each of the sites shall furnish and install, but not limited
71 to, the following items:
72

73 **(1) 332A Fiberoptic cabinet with outdoor Category 6 cable between the**
74 **170E Ethernet Module and Ethernet Switch**
75

76 **(2) Ethernet Module** meet the following requirements:

- 77 (a) The module shall have the Model 400 modem footprint
- 78 (b) EIA-232 Interface to the 170 Controller
- 79 (c) RJ45 Ethernet Interface
- 80 (d) Direct IP addressing
- 81 (e) Auto-Sensing 10Base-T or 100Base-T
- 82 (f) Compatible with BI Tran QuicNet 4
- 83 (g) Operating temperature shall be 37°C to +74°C
- 84 (h) Data Rates 1200 to 38.4 kbps
- 85 (i) Characters 7 or 8 data bits
- 86 (j) Parity: odd, even, or none. Stop: bits 1 or 2
- 87 (k) Operate between +12 volts @ 125 mA Max and -12 volts @ 25 mA
88 Max
- 89 (l) On-board LED Indicators, Red Tx and Rx LEDs
- 90 (m) Supports Protocols TCP/IP, ARP, UDP, ICMP, Telnet, TFTP, DHCP,
91 HTTP, SNMP protocols

- 92 (n) Connector RJ-45
93 (o) A minimum of 2 Year warranty
94
95 **(3) Hardened Managed Ethernet Switch** Meet the following requirements:
96 (a) Shall support the transmission of minimum of 3 channels of 1000 Mbps
97 over two single-mode fibers.
98 (b) Shall support the transmission of 7 channels of 10/100 Mbps over Cat-6
99 cable.
100 (c) Shall support the Ethernet data IEEE 802.3 protocol using Auto-
101 negotiating and Auto-MDI/MDI-X features.
102 (d) Features a 1000 Base-FX optical port.
103 (e) Shall require no in-field electrical or optical adjustments or in-line
104 attenuators to ease installation.
105 (f) Shall provide power, link speed, and fiber port status indicating LED's for
106 monitoring proper system operation.
107 (g) Provides a contact closure for an over temperature alarm.
108 (h) Shall provide automatic re-settable solid-state current limiters and
109 independent voltage regulators on each module to reduce the chance
110 of a single point failure of the system.
111 (i) Shall have redundant power supply connections to minimize single point
112 failure.
113 (j) Shall provide a serial connection for local management of the device.
114 (k) Shall operate in an environment with relative humidity of 0% to 95% (non-
115 condensing).
116 (l) Shall operate in an environment with an ambient temperature range of –
117 40° C to +74° C without the assistance of fan-forced cooling.
118 (m) Shall be rack mountable.
119 (n) Shall have a lifetime warranty.
120
121

122 **(B) Dual Camera Site Equipment.** The Contractor shall at each of the sites where
123 shown on the plans, furnish and install, but not limited to, the following items:
124

125 **(1) 2 Each, Color Camera Package, Y2' Format, Zoom Lens, Auto-Iris/Manual**
126 **Override, 7.5 to 75mm FL, Video Output 1 volt p-p, 75 ohms, MIL connectorized**
127 As described in section 636.03 Cabinet.

128 **(2) 2 Each, Side or top mounted pole bracket for camera.**

129 **(3) 2 Each, Video/Data IP Encoder** Meet the following requirements:

- 130 (a) H264 encoding
131 (b) Adjustable IP Packet size streams.
132 (c) Flash memory.
133 (d) Remote user reset via all modes of interface.
134 (e) NTSC video format at 30 frames per second
135 (f) Max pixel resolution of 720x480
136 (g) Less than 200 msec video latency
137 (h) 75-ohm, unbal BNC (f) connectors

- 138 (i) RJ-45 Ethernet connectors, 10/100BaseT-TX
139 (j) Auto sensing, half/full duplex
140 (k) One static IP address for the Encoder, Classes A, B, or C configurable by
141 the user.
142 (l) Gateway needs to be user configurable or can be left blank.
143 (m) User configurable RS232/RS422/RS485 asynchronous port
144 • Data rates from 300 bps to 57600 Kbps
145 • Stop bits 1
146 • Databits 5, 6, 7, 8 or 9
147 • None, even, or odd, parity
148 • IP socket to Encoder serial port in both UDP and TCP/IP
149 • Encoder serial port to Decoder serial port data stream
150 • Local and remote Loopback Test Capability
151 (n) -40 degrees C to +75 degrees C operating temperature
152

153 **(4) 1 Each, Video/Data IP Decoder** meet the following requirements:
154

- 155 (a) H264 encoding
156 (b) Adjustable IP Packet size streams.
157 (c) Flash memory.
158 (d) Remote user reset via all modes of interface.
159 (e) NTSC video format at 30 frames per second capability
160 (f) Max pixel resolution of 720x480
161 (g) Less than 200 msec video latency
162 (h) 75-ohm, unbal BNC (f) connectors
163 (i) RJ-45 Ethernet connectors, 10/100BaseT-TX
164 (j) Auto sensing, half/full duplex
165 (k) One static IP address for the Encoder, Classes A, B, or C configurable by the
166 user.
167 (l) Gateway needs to be user configurable or can be left blank.
168 (m) RS232/RS422/RS485 asynchronous port
169 • Standard data rates from 300 bps to 115,200 bps, 8N1
170 • One front panel Craft port set permanently for 9600 bps, 8N1
171 • Stop bits 1 and 2
172 • Databits 5, 6, 7, 8, 9, 10, 11 or 12
173 • None, even or odd, space or mark parity
174 • IP socket to Encoder serial port
175 • Encoder serial port to Decoder serial port data stream
176 (n) Local and remote Loopback Test Capability
177
178 (o) -40 degrees C to +75 degrees C operating temperature
179

180 **(5) 1Ea., Hardened Managed Ethernet Switch** Meet the following requirements:
181

- 182 (a) Shall support the transmission of a minimum of 3 channels of 1000 Mbps over
183 two single-mode fibers.

- 184 (b) Shall support the transmission of a minimum of 7 channels of 10/100 Mbps
185 over Cat-6 cable.
- 186 (c) Shall support the Ethernet data IEEE 802.3 protocol using Auto-negotiating
187 and Auto-MDI/MDI-X features.
- 188 (d) Features a 1000 Base-FX optical port.
- 189 (e) Shall require no in-field electrical or optical adjustments or in-line attenuators
190 to ease installation.
- 191 (f) Shall provide power, link speed, and fiber port status indicating LED's for
192 monitoring proper system operation.
- 193 (g) Provides a contact closure for an over temperature alarm.
- 194 (h) Shall provide automatic re-settable solid-state current limiters and independent
195 voltage regulators on each module to reduce the chance of a single point
196 failure of the system.
- 197 (i) Shall have redundant power supply connections to minimize single point
198 failure.
- 199 (j) Shall provide a serial connection for local management of the device.
- 200 (k) Shall operate in an environment with relative humidity of 0% to 95% (non-
201 condensing).
- 202 (l) Shall operate in an environment with an ambient temperature range of -40° C
203 to +74° C without the assistance of fan-forced cooling.
- 204 (m) Shall be rack mountable.
- 205 (n) Shall have a lifetime warranty.

206
207 **(6) 1 Each, Rack Mounted 72 Splice Capacity SC Compatible Patch Panel, ADC**
208 **FDM-SB36000** With all necessary splice fittings and pigtails.

209
210 **(7) Incidentals.** Furnish and install all necessary cables and hardware for power,
211 control data, and video. Local CCTV Power requires Type TC, 3#16 stranded
212 conductors XHHW, 60OV, PE jacket; Control requires 2 pair, 18 AWG stranded,
213 shielded outdoor PE jacket; Video requires RG6 outdoor, 20 gage solid copper,
214 coaxial-cable inline electrical protection and isolation device will be included as part
215 of this bid item, and outdoor Cat 6 U/UTP . Where No. 4, 6, and 8 HE feeder cables
216 and service meters are necessary, the said items will not be paid for as a separate
217 unit and will be considered incidental. All other equipment and labor necessary to
218 complete a fully operational system will be the Contractor's responsibility and
219 considered incidental to the cost of the camera site bid.

220
221
222 **(C) Quad Camera Site Equipment.** The Contractor shall at each of the sites where
223 shown on the plans, furnish and install, but not limited to, the following items:

- 224
225
226 **(1) 4 Each, Color Camera Package, Y2' Format, Zoom Lens, Auto-Iris/Manual**
227 **Override, 7.5 to 75mm FL, Video Output 1 volt p-p, 75 ohms, MIL connectorized**
228 **as described in section 636.03.**
229

- 230 **(2) 42 Each, Side or top mounted pole bracket for camera.**
231
232 **(3) 4 Each, Video/Data IP Encoder** Meet the following requirements:
233 (a) H264 encoding
234 (b) Adjustable IP Packet size streams.
235 (c) Flash memory.
236 (d) Remote user reset via all modes of interface.
237 (e) NTSC video format at 30 frames per second
238 (f) Max pixel resolution of 720x480
239 (g) Less than 200 msec video latency
240 (h) 75-ohm, unbal BNC (f) connectors
241 (i) RJ-45 Ethernet connectors, 10/100BaseT-TX
242 (j) Auto sensing, half/full duplex
243 (k) One static IP address for the Encoder, Classes A, B, or C configurable by the
244 user.
245 (l) Gateway needs to be user configurable or can be left blank.
246 (m) User configurable RS232/RS422/RS485 asynchronous port
247
 - Data rates from 300 bps to 57600 Kbps
 - Stop bits 1
 - Databits 5, 6, 7, 8 or 9
 - None, even, or odd, parity
 - IP socket to Encoder serial port in both UDP and TCP/IP
 - Encoder serial port to Decoder serial port data stream
 - Local and remote Loopback Test Capability
254 (n) -40 degrees C to +75 degrees C operating temperature
255
256 **(4) 1 Each, Video/Data IP Decoder** meeting the following requirements:
257 (a) H264 encoding
258 (b) Adjustable IP Packet size streams.
259 (c) Flash memory.
260 (d) Remote user reset via all modes of interface.
261 (e) NTSC video format at 30 frames per second capability
262 (f) Max pixel resolution of 720x480
263 (g) Less than 200 msec video latency
264 (h) 75-ohm, unbal BNC (f) connectors
265 (i) RJ-45 Ethernet connectors, 10/100BaseT-TX
266 (j) Auto sensing, half/full duplex
267 (k) One static IP address for the Encoder, Classes A, B, or C configurable by the
268 user.
269 (l) Gateway needs to be user configurable or can be left blank.
270 (m) RS232/RS422/RS485 asynchronous port
271
 - Standard data rates from 300 bps to 115,200 bps, 8N1
 - One front panel Craft port set permanently for 9600 bps, 8N1
 - Stop bits 1 and 2
 - Databits 5, 6, 7, 8, 9, 10, 11 or 12
 - None, even or odd, space or mark parity
274
275

276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
292
293
294
295
296
297
298
299
300
301
302
303
304
305
306
307
308
309
310
311
312
313
314
315
316
317
318
319
320
321

- IP socket to Encoder serial port
- Encoder serial port to Decoder serial port data stream
- Local and remote Loopback Test Capability

(n) -40 degrees C to +75 degrees C operating temperature

(5) 1 Ea., Hardened Managed Ethernet Switch Meet the following requirements:

- (a) Shall support the transmission of a minimum of 3 channels of 1000 Mbps over two single-mode fibers.
- (b) Shall support the transmission of a minimum of 7 channels of 10/100 Mbps over Cat-6 cable.
- (c) Shall support the Ethernet data IEEE 802.3 protocol using Auto-negotiating and Auto-MDI/MDI-X features.
- (d) Features a 1000 Base-FX optical port.
- (e) Shall require no in-field electrical or optical adjustments or in-line attenuators to ease installation.
- (f) Shall provide power, link speed, and fiber port status indicating LED's for monitoring proper system operation.
- (g) Provides a contact closure for an over temperature alarm.
- (h) Shall provide automatic re-settable solid-state current limiters and independent voltage regulators on each module to reduce the chance of a single point failure of the system.
- (i) Shall have redundant power supply connections to minimize single point failure.
- (j) Shall provide a serial connection for local management of the device.
- (k) Shall operate in an environment with relative humidity of 0% to 95% (non-condensing).
- (l) Shall operate in an environment with an ambient temperature range of -40° C to +74° C without the assistance of fan-forced cooling.
- (m) Shall be rack mountable.
- (n) Shall have a lifetime warranty.

(6) 1 Each, Rack Mounted 72 Splice Capacity SC Compatible Patch Panel, ADC FDM-SB36000 with all necessary splice fittings and pigtails.

(7) Incidentals. Furnish and install all necessary cables and hardware for power, control data, and video. Local CCTV Power requires Type TC, 3#16 stranded conductors XHHW, 600V, PE jacket; Control requires 2 pair, 18 AWG stranded, shielded outdoor PE jacket; Video requires RG6 outdoor, 20 gage solid copper, coaxial-cable inline electrical protection and isolation device will be included as part of this bid item, and outdoor Cat 6 U/UTP . Where No. 4, 6, and 8 HE feeder cables and service meters are necessary, the said items will not be paid for as a separate unit and will be considered incidental. All other equipment and labor necessary to complete a fully operational system will be the Contractor's responsibility and considered incidental to the cost of the camera site bid.

322 **(D) Gigabit Layer 3 Switch Site Equipment.** The Central Gigabit Layer 3 Switch Site
323 Equipment includes the gigabit switch in the field and the Joint Traffic Management
324 Center (JTMC). The Central Gigabit Switch Site Equipment will provide a high
325 bandwidth connection between the Central Gigabit Switch Site and the JTMC. The
326 gigabit switch in the field will forward any number of IP packets consisting of MPEG-4
327 compressed video, camera data and signal control data between the JTMC's gigabit
328 switch and the camera and signal on-site switches. At the JTMC's gigabit switch, IP
329 video and data decoders shall be integrated to the existing switcher inputs and outputs.
330 All necessary combiners, splitters, power supplies, racks, cables, expansion cards, and
331 other associated hardware needed to complete a fully operational system shall be
332 furnished and installed by the Contractor and considered included in the cost of the
333 other items in the bid.

334
335 The Contractor shall remove existing items, furnish, install, and integrate, but not limited
336 to, the following items at the hub locations where shown on the plans and at the JTMC
337 as designated:

338
339 **(1) 1 Each, Hardened Gigabit Managed Ethernet Layer 2 Switch** Meet the following
340 requirements:

- 341
342 (a) Shall support the transmission of a minimum of 4 channels of 1000 Mbps over
343 two single-mode fibers.
- 344 (b) Shall support the transmission of 24 channels of 10/100/1000 Mbps over Cat-6
345 cable.
- 346 (c) Shall support the Ethernet data IEEE 802.3 protocol using Auto-negotiating
347 and Auto-MDI/MDI-X features.
- 348 (d) Features 24 fixed 10/100 Base-T electrical ports and 8 100 Base-FX optical
349 ports.
- 350 (e) Features 4 1000 Base-FX optical ports.
- 351 (f) Shall require no in-field electrical or optical adjustments or in-line attenuators
352 to ease installation.
- 353 (g) Shall provide power, link speed, and fiber port status indicating LED's for
354 monitoring proper system operation.
- 355 (h) Provides a contact closure for an over temperature alarm.
- 356 (i) Shall provide automatic re-settable solid-state current limiters and independent
357 voltage regulators on each module to reduce the chance of a single point
358 failure of the system.
- 359 (j) Shall have redundant power supply connections to minimize single point
360 failure.
- 361 (k) Shall provide a serial connection for local management of the device.
- 362 (l) Shall operate in an environment with relative humidity of 0% to 95% (non-
363 condensing).
- 364 (m) Shall operate in an environment with an ambient temperature range of -0° C to
365 +50° C without the assistance of fan-forced cooling.
- 366 (n) Shall be rack mountable.
- 367 (o) Shall have a minimum 2 year warranty.

368
369
370
371
372
373
374
375
376
377
378
379
380
381
382
383
384
385
386
387
388
389
390
391
392
393
394
395
396
397
398
399
400
401
402
403
404
405
406
407
408
409
410
411
412
413
414
415
416
417

(2) Incidentals. All other equipment and labor necessary to complete a fully operational system will be the Contractor's responsibility and considered incidental to the cost of the bid.

(E) CTV TRAFFIC CAMERA ASSEMBLY. The camera assemblies are for the replacement and maintenance of the existing traffic cameras used for traffic monitoring and traffic signal operations at the Traffic Management Center. It shall be an integrated camera unit consisting of a receiver, pan & tilt, housing, and cables built as a single assembly having 360 degree of continuous pan rotation. The camera shall have full HD 1080p30 image resolution with integral 30x optical zoom lens. The positioning device shall include true day-night with variable speed pan and tilt technology with a minimum sensitivity of 0.0 lux @30 IRE. The camera shall provide up to 5 independent output video streams configurable for H.264 and MJPEG and analog video output, electronic image stabilization, and wide dynamic range. Camera assembly shall be furnished with components assembled, complete, and a ready-to-install system. Camera system shall meet FHWA's Buy America requirement.

(1) CAMERA IMAGING

- (a)** Image Sensor: Progressive Scan CMOS
- (b)** Image Size: Diagonal 6mm
- (c)** Image Resolution: 1920 horizontal x 1080 vertical pixels
- (d)** Picture Elements (total) 1920 (H) x 1440 (V)
- (e)** Sensitivity: Scene Illumination; F1.4 @ 50% Video
 - a. 0.4 Lux (0.04 fc) @ 1/30 shutter, color mode
 - b. 0.0025 Lux (0.00025 fc) @ 1/2 shutter, mono mode
- (f)** Day/Night Operation: Adjustable (Auto, Color and Mono Modes)
- (g)** Optical Zoom Range: 30x, minimum
- (h)** Digital Zoom: 1x to 12x in 1x increments. The camera system shall support digital zoom limit setting
- (i)** Auto Focus: Selectable Auto/Manual; Minimum Scene Illumination for Reliable Auto Focus shall be no more than 50% video output.
- (j)** Auto Iris; Selectable auto/manual; Iris shall automatically adjust to compensate for changes in scene illumination to maintain constant video level output.
- (k)** Electronic Image Stabilization: Shall support On/Off mode.
- (l)** Backlight Compensation: Shall support On/Off mode.
- (m)** White Balance: Shall support Auto/Manual Mode.
- (n)** IR Correction: Shall support On/Off mode.
- (o)** Sharpness: Shall provide user control of increases or decreases in image sharpness through 4 user selectable settings of soft, normal, sharp and sharpest.

(2) H.264/MJPEG ENCODING ENGINE

- (a)** The video encoding shall allow the following possible video stream configurations;
- (b)** H.264 Streams: (1) 1920x1080 @ 30fps, (1) 1280x720 @ 30 fps, (1) 720x480 @ 15 fps
- (c)** MJPEG Streams: 1920x1080 @ 10 fps, 1280x720 @ 20 fps Analog Video Output: (1)
- (d)** Each video encoder channel shall provide the following configurable properties;
 - I. Codec

- 418 II. Video frame shall be adjustable from 30 fps to 1 fps in increments of 1 fps
419 III. Bite Rate control
420
421 (e) Video Stream Protocols; the camera system shall support the following
422 protocols:
423 I. RTSP/RTP; The RTSP communication shall occur over a TCP socket.
424 RTP video packets shall be sent over UDP.
425 II. RTSP Interleaved; RTSP commands and the RTP video packets shall be
426 transmitted over a single TCP connection.
427 III. HTTP tunneling; this mode shall use two separate TCP connections for
428 sending and the other for received data from the client over port 80.
429 IV. RTP multicast; this mode shall send RTP video packets to the user
430 assigned multicast destination. This mode shall be required to be enabled
431 or disabled.
432
433 (f) Network Protocol Layers: TCP, UDP, IPv4, IGMP, ICMP, DNS, DHCP, RTP,
434 RTSP, NTP, HTTP, HTTPS, ARP, and ONVIF Profile S as a minimum
435

436 (3) PAN AND TILT DRIVE UNIT SPECIFICATIONS

- 437 (a) Pan Movement; 360 degrees continuous rotation
438 (b) Pan Speed; Variable from 0.05 to 45 degrees/second
439 (c) Pan Repeatability; +/- 0.05 degree precision
440 (d) Pan Preset Speed; 180 degree movement 2.5 < Seconds
441 (e) Tilt Movement; Minimum of +90 to -90 degrees
442 (f) Tilt Speed; Variable from 0.05 to 45 degrees/second.
443 (g) Tilt Repeatability; +/- 0.05 degree precision
444 (h) Tilt Preset Speed; 180 degree movement < 2.5 Seconds
445 (i) Proportional Zoom Control; Positioning control shall allow variable
446 pan/tilt speeds based on zoom position.
447 (j) Home Position: Shall be a user defined point
448 (k) The (IPCS) shall not have any exposed wiring from the positioning drive
449 to the camera head enclosure.
450

451 (4) Electrical. Operating Voltage; The camera system shall provide flexible power input 452 options as required by the installation to include:

- 453
454 (a) Power over Ethernet, LTPoE++™ @ 60W
455 (b) Optional 24Vac
456 (c) Optional 120Vac
457

458 (5) Certifications/Ratings

- 459
460 (a) FCC Class A
461 (b) IEC/CE CISPR 22 24
462 (c) RoHs
463

464 (6) Enclosure

- 465
466 (a) Aluminum
467 (b) Dust-tight
468 (c) Waterproof & Pressurized

469 (7) **Controls** Shall be controllable or interoperable by a Pelco analog switcher and
470 control System using Pelco P protocol

471
472 (8) **Adapter Plate** A Stainless Steel, ¼" minimum, adapter plate shall be provided to
473 integrate the supplied camera mounting to the existing mounting.

474
475 (9) **Warranty** Manufacturer's warranty period shall be three (3) years
476

477 **636.03 Cabinet**

478 **(A) Mount**

479
480
481 (1) Outdoor type

482 (2) Aluminum or stainless steel components

483 (3) Mount cantilever style on pole shafts using straps, or on horizontal mast arm shaft

484 (4) Constructed of marine grade stainless steel

485 (5) Has cable feed-through

486 (6) Supports up to 100 lbs

487 (7) Painted White

488 (8) Wall to pole mount adapter, as required

489 (9) Provide ability to level and adjust camera to plumb
490

491 (B) **CCTV Cabinet.** 1 Each, per single camera and dual camera site. Cabinet
492 shall be a Caltrans Traffic Signal 332A anodized aluminum cabinet with a 19"
493 rack, 20amp circuit breaker set-up, surge-protected and noise-isolation 6-outlet
494 strip, and thermo-control fan. Furnish and install power cables from existing
495 traffic signal meter or new Hawaiian Electric service point.
496

497 (C) **Cabinet Foundation.** 1 Each, per CCTV cabinet. Construction per details on
498 drawings.
499

500 **636.04 Measurement.** The Engineer will measure the various components of the
501 system per unit when contracted on a unit price basis.
502

503 (A) The Engineer will measure camera site equipment, Gigabit switch site equipment,
504 splice cabinets, Type "D" cabinet base, and guy and anchor; per each, complete in
505 place. The conduits for the Type 'D' traffic signal cabinet base will not be measured
506 but considered part of the concrete base each-unit.
507

508 (B) Removal of various components of the system will be on a lump sum basis.
509 Measurement will not apply to payment.
510

511 (C) The Engineer will measure ductline and camera cable per linear foot in accordance
512 to the contract plans.
513

514 **636.05 Payment.** The Engineer will pay for the accepted quantities of the various
515 components of the system at the contract unit price, complete in place.

516
517
518
519
520
521
522
523
524
525
526
527
528
529
530
531
532
533
534
535
536
537
538
539
540
541
542
543
544
545
546
547

The Engineer will pay for accepted quantities of camera site equipment, hub site equipment, splice cabinets, Type "D" concrete base, poles, cables, conduits, and risers at the contract unit price per each completed in place. The price shall include furnishing and installing the items, and all tools, labor, equipment, and incidentals necessary to complete the work. The conduits for the Type "D" will not be paid for but considered included in the base unit price.

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

Pay Item	Pay Unit
CCTV, Controller, CCTV	Each
CCTV Type "C" Pullbox	Each
CCTV Ductline _____, Concrete Encased	L.F.
Dual Camera Site Equipment	Each
Quad Camera Site Equipment	Each
CCTV Camera Cable	L.F.
Removal of _____	Lump Sum
Broadband Type "B" Pullbox	Each
Broadband Ductline _____, Conc. Encased	L.F."

END OF SECTION 636

1 **SECTION 638 – PORTLAND CEMENT CONCRETE CURB AND GUTTER**

2
3 Make the following amendments to said Section:

4
5 **(I)** Amend **638.04 – Measurement** by revising lines 130 to 131 to read as
6 follows:

7
8 **“638.04 Measurement.** The Engineer will measure curb and/or gutter, both
9 new, by the linear foot. The Engineer will measure along the front face of the
10 curb at the finished grade elevation. The Engineer will not make deduction in
11 gutter length for drainage appurtenances installed such as catch basins and drop
12 inlets.

13
14 The Engineer will measure curb and/or gutter transition for payment as
15 follows:

16

From	To	Measurement for Payment
Cast-in-place Curb or Precast Curb	Cast-in-place Curb and Gutter	Cast-in-place Curb and Gutter
Cast-in-place Curb and Gutter	Precast Curb and Cast-in-place Gutter	Cast-in-place Curb and Gutter
Cast-in-place Curb and Gutter Type _____	Cast-in-place Curb and Gutter Type _____	Cast-in-place Curb and Gutter 1/2 of Transition to each type
Cast-in-place Curb Type _____	Cast-in-place Curb Type _____	Cast-in-place Curb 1/2 of Transition to each type

17
18 The Engineer will measure precast concrete drop curb and driveway curb
19 or cast-in-place integral driveway curb and gutter under the adjacent normal curb
20 and/or gutter.”

21
22 **(II)** Amend **638.05 – Payment** by revising lines 133 to 148 to read as follows:

23
24 **“638.05 Payment.** The Engineer will pay for the accepted quantities of curb
25 and/or gutter at the contract unit price per linear foot for each type of curb and/or
26 gutter specified.
27

28 Payment will be full compensation for work prescribed in this section and
29 contract documents.

30
31 The Engineer will pay for each of the following pay items when included in
32 proposal schedule:

33	Pay Item	Pay Unit
34		
35		
36	Curb, Type _____	Linear Foot
37		
38	Curb and Gutter, Type _____	Linear Foot"
39		
40		
41		
42		
43		

END OF SECTION 638

1 **SECTION 641 – HYDRO-MULCH SEEDING**

2
3 Make the following amendments to said Section:

4
5 **(I)** Amend **641.05 – Payment** by adding the following paragraph after line
6 201 to read as follows:

7
8 “The Engineer will not pay for erosion control matting separately and will
9 consider the cost for those items as included in the contract prices for hydro-
10 mulch seeding. The cost is for the work prescribed in this section and the
11 contract documents.”

12
13 **END OF SECTION 641**

1 **SECTION 645 – WORK ZONE TRAFFIC CONTROL**

2
3 Make the following amendments to said Sections:

4
5 **(I)** Amend **Section 645.02** **Materials** by revising from lines 39 to 48 to
6 read as follows:

7
8 “Submit at least 30 working days before work starts, 3 sets of
9 FHWA approval letters certifying compliance with AASHTO Manual for
10 Assessing Safety Hardware (MASH) for signs, sign supports, barricades,
11 delineators, cones, vertical panels, concrete barriers with MASH end
12 treatments, and other traffic control devices.

13
14 Furnish to Engineer at least 30 working days before work starts, 3
15 sets of self-certified MASH compliant letter from the vendor for each type
16 of Category 1 traffic control device, as defined in MASH, including single-
17 piece traffic cone, single-piece drum, tubular marker, and delineator.

18
19 Use of signs, sign supports, barricades, delineators, cones, vertical
20 panels, and other traffic control devices that are not certified to be MASH
21 compliant shall not be used unless a request for a waiver is submitted in
22 writing and a written wavier is given by the Engineer.”

23
24
25 **END OF SECTION 645**
26

1 Delete Section 647 in its entirety and replace with the following:
2

3 **“SECTION 647 – FIBER OPTIC CABLE**
4

5 **647.01 Description.** This work includes furnishing labor, materials, tools,
6 machinery, and equipment necessary to install fiber optic cable according to the
7 contract.
8

9 There shall be a fiber optic cable Subcontractor, who shall have at least 3
10 (three) years experience in installing fiber optic systems over \$250,000,
11 specifically for outdoor overhead joint-pole and underground in traffic-highway
12 applications. The fiber optic cable Subcontractor shall be responsible for testing
13 all fiber optic cables to provide a documented optical budget loss analysis for
14 each link to and from a hub station. The fiber optic cable Subcontractor shall be
15 responsible for all hookups, assignments, dedication, testing, matching, and
16 splicing of the fiber optic cables, unless otherwise indicated. All fiber optic splice
17 points shall be spliced color-for-color whenever matching pairs are available.
18 The fiber optic cable Subcontractor shall be fully responsible for all splices,
19 budget loss, attenuators, appropriate fiber hardware, accessories, and pigtail
20 connections for a fully operational system. All other hardware, equipment, and
21 labor necessary shall be considered incidental.
22

23 **647.02 Materials.** The fiber optic cables, which will be used to transmit
24 video and data signals, will consist of single-mode fibers. Cables will be installed
25 in existing and new conduits. The Contractor shall furnish and install fiber optic
26 cable suitable, and meeting standards, for underground and aerial lashing
27 installations. The fiber optic cables shall meet the following specifications:
28

29 The cable shall meet the requirements of the United States Department of
30 Agriculture (USDA) Rural Utilities Service (RUS) 7 CFR 1755.900 and shall be
31 included in the most current “USDA List Of Acceptable Materials For Use On
32 Telecommunications Systems Of RUS Borrowers”.
33

34 **(A) Single-mode Fiber.** The single-mode fiber utilized in the cable
35 specified herein shall be dispersion unshifted and conform to the following
36 specifications:
37

38 Cladding diameter: 125 $\mu\text{m} \pm 1.0 \mu\text{m}$

39 Core-to-cladding offset: < 0.6 μm

40 Cladding Non-circularity: < 1.0%

41 Coating diameter: 245 $\pm 10 \mu\text{m}$

42 Colored fiber diameter: Nominal 250 μm

43 Attenuation uniformity: No point discontinuity greater than 0.10 dB at
44 either 1310 nm or 1550 nm.

45 Attenuation at the water peak: The attenuation at 1388 $\pm 3 \text{ nm}$ shall not
46 exceed 2.1 dB/kM.

47 Cutoff wavelength: The cabled fiber cutoff wavelength shall be < 1260
48 nm.
49 Mode-field diameter: 9.30 ± 0.50 μm at 1310 nm
50 10.50 ± 1.00 μm at 1550 nm
51 Zero Dispersion wavelength: < 1301.5 nm
52 Zero Dispersion Slope: <0.092 ps/(nm²kM)
53 Fiber polarization mode dispersion: < 0.5ps/kM
54

55 The coating shall be a dual layered, UV cured acrylate applied by the fiber
56 manufacturer. The coating shall be mechanically strippable.
57

58 **(B) Fiber Specification Parameters.**
59

60 Required fiber grade: Maximum individual fiber attenuation.
61

62 Single mode – The maximum dispersion shall be ≤ 3.2 ps/nm²kM
63 from 1285 to 1330 nm and shall be < 18 ps/nm-kM at 1550 nm.
64

65 All optical fibers shall be proof tested by the fiber manufacturer to a
66 minimum load of 0.7 GN.m² (100 kpsi).
67

68 **(C) Specifications for Outdoor Cable Construction.** Optical fibers
69 shall be inside a loose buffer tube in groups of 12. Optical fibers shall be
70 mechanically strippable. Gel filled cables shall not be used. The fiber
71 shall be colored with ultraviolet (UV) curable links. Each fiber shall be
72 distinguishable by means of color coding in accordance with TIA/EIA-598-
73 A, “Optical Fiber Cable Color Coding”.
74

75 Loose buffer tubes shall also be colored with distinct and
76 recognizable colors in accordance with TIA/EIA-598-A, “Optical Fiber
77 Cable Color Coding” and shall be marked Singlemode. Fillers may be
78 included in the cable core to lend symmetry to the cable cross section
79 where needed. Cable construction shall utilize dielectric strength
80 members.
81

82 Cable jacket shall be a PVC material that is fungus, water and UV
83 resistant. The jacket shall be marked with the manufacturer’s name,
84 sequential meter or foot marking, month and year of manufacture.
85

86 The maximum pulling tension shall be 2700 N (608 lbft) during
87 installation (short term) and 890 N (200 lbft) long term installed.
88

89 The shipping, storage, and operating temperature range of the
90 cable shall be –40C to +70C.
91

92
93
94
95
96
97
98
99
100
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137
138

(D) Quality Assurance Provision. All cabled optical fibers > 1000 meters in length shall be 100% attenuation tested. Attenuation of each fiber shall be provided with each cable reel.

The cable manufacturer shall be ISO 9001 registered.

(E) Packaging. Top and bottom ends of the cable shall be available for testing.

Both ends of the cable shall be sealed to prevent the ingress of moisture. Each reel shall have a weather resistant reel tag attached identifying the reel and cable.

The reel tag shall include the following information:

Cable number	Gross Weight
Shipped length in meters	Job order number
Product Number	Date cable tested

Each cable shall be accompanied by a cable data sheet. Cable data shall include manufacturer number, billable length, bandwidth specs and measured attenuation of each fiber.

(F) City Furnished Fiber Optic Cable. The City will make available to the Contractor for use in this project, a length of single-mode fiber optic cable of the length specified in the Proposal. The Contractor shall install the cable in the existing State Department of Transportation traffic signal raceway system.

(G) Raceway Innerduct. Raceway Innerduct shall be installed in all new and existing raceways containing new 72 strand fiber optic cables. Innerduct will consist of flexible, textile material, commonly referred to as "fabric duct". Fabric duct will have, the following minimum specifications:

(1) Three cell configuration, shall be attached the entire length of the product, to help minimize twisting of cable. Maximum coefficient of friction shall be 0.08.

(2) Innerduct shall contain color coded stitching for cell identification, with a solid copper, polyvinyl color coated conductor (19 AWG minimum) for tracing, rated for a minimum of 6 amps and 600 volts. Conductor shall be located in the sidewall edge fold of the sleeve.

(3) All cells will contain a minimum 1250lb pull tape, color coded.

MaxCell or approved BICSI compliant product.

139 **647.03 Construction Requirements.**

140
141 **(A) Material Sample and Certificate of Compliance.** The Contractor
142 shall submit material samples according to Subsection 106.04 – Material
143 Sample, and any certificates of compliance according to Subsection
144 106.07 – Certificate of Compliance.

145
146 The Contractor shall submit a fiber optic cable pulling plan for
147 review and approval by the Engineer prior to beginning fiber optic cable
148 installation. The fiber optic cable pulling plan shall include:

- 149
150 (1) Location of start and end of pulls,
151
152 (2) Location of cable reel trailers during installation,
153
154 (3) Location of any “figure-eight” of fiber optic cable, and
155
156 (4) Location of staged equipment.

157
158 Upon completion of the work, submit an “As Built” or corrected plan
159 showing in detail the following:

- 160
161 (1) Construction changes,
162
163 (2) Location and attenuation of every event along the installed
164 fiber optic cable,
165
166 (3) Index of refraction of installed fiber,
167
168 (4) Fiber optic cable index of refraction, and
169
170 (5) Sequential fiber optic cable markings at each pullbox,
171 cabinet, and splice closure.

172
173 **(B) Excavation and Backfill.** Excavation and backfill shall conform to
174 Section 204 – Excavation and Backfill for Miscellaneous Facilities.

175
176 The Contractor shall be responsible for the repair of any damage to
177 pavements, sidewalks and other improvements. Place the material from
178 the excavation to prevent damage and obstruction to vehicular and
179 pedestrian traffic and interference with surface drainage.

180
181 **(C) Fiber Optic Cable.** The fiber optic cable Subcontractor shall install
182 the new fiber optic cable underground in conduits as shown on the plans.
183 The Contractor will be responsible for furnishing and pulling the new fiber
184 in PVC ductlines using a breakaway swivel to prevent exceeding the
185 tensile load during installation.

186
187
188
189
190
191
192
193
194
195
196
197
198
199
200
201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224
225
226
227
228
229
230
231
232

All fiber optic splices shall be fusion splices. Mechanical splices shall not be used. Fiber optic splice locations are permitted only at splice points where splice cabinets are shown on the plans, or in existing State Department of Transportation signal pullboxes as is necessary, and only with the prior approval of the Department of Transportation Services (DTS), and the State Department of Transportation (DOT), Highways Division. Fiber optic fibers shall be spliced in every splice cabinet location, and it is the responsibility of the Contractor to maintain a continuous run throughout the system. The Contractor shall leave a minimum of 20-feet of cable service loops at every cabinet or splice location.

Provide documented historical cable pulling data indicating tensile forces exerted on the cable during the installation. Any tension measurements, which exceed the manufacturer's recommendation, will be considered means for the cable rejection. The fiber optic cable Subcontractor shall be fully responsible for the quality and integrity of the installed cable and the operability of the final fiber optic cable product. All fibers shall be spliced at camera cabinets, hubs, and splice cabinets and shall have no more than 0.07 dB loss per splice based on the appropriate system operating wavelength.

The Contractor shall complete all required fiber optic splices prior to final testing and acceptance. As part of the final testing and acceptance, submit optical time domain reflectometer (OTDR) readings in both hardcopy and electronic formats (such that it can be examined using the manufacturer's OTDR software) to the Engineer for review. Testing shall be conducted on all singlemode fibers at 1310 nm and 1550 nm. Powermeter attenuation testing should be performed at dual wavelength, bi-directionally.

All necessary equipment and plug-in, fiber optic pigtails, fittings, splice tags, enclosures, and work to complete an operational system shall be furnished and installed by the Contractor, unless otherwise indicated, at no added cost, and will be considered included in the cost of the contract items in this Section.

(D) Services Provided By The City.

The City and County of Honolulu, Department of Transportation Services (DTS) will not be responsible for any splices or connections in pullboxes and cabinet locations unless indicated in the plans.

The Contractor shall be responsible for the following:

- (1)** The Contractor will be responsible for all required splices and connections in pullboxes and CCTV cabinet locations.

233
234
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
273
274
275
276
277
278

(2) Arrange for phases of work with DTS or as specified by the Engineer.

(3) Give at least seven calendar days of advance notice to DTS when phases of the work require its services.

(E) Restoring Pavements and Other Improvements. Restore the existing pavements and other improvements such as driveways, sidewalks, curbs and gutters disturbed by excavation to their original condition according to the contract. Materials used for restoration work shall be equal to or better in quality than the materials the Contractor will replace, and matching in thickness, texture, and color whenever applicable. The grades of the restored surfaces shall conform to the existing grades.

(F) Warranty. Materials and equipment installed for permanent construction shall be new. The contract contemplates the use of first-class material and equipment throughout the performance of the contract.

Secure from the manufacturer(s), a warranty or warranties guaranteeing equipment from defects in materials, design and workmanship for not less than 12 months from the date of acceptance.

When requiring adjustments or repairs during the warranty period, adjust or repair the existing unit within 24 hours from the time of notification.

When requiring repairs that need factory corrections during the warranty period, replace the existing unit with an accepted temporary operational replacement unit within 24 hours from the time of notification until the Contractor can install the new unit. Install the new, identical non-defective unit within 30 days from the time of notification.

647.04 Method of Measurement.

(A) The Engineer will measure the fiber optic cables, inner duct, and ductline per linear foot. The Engineer will not measure the fiber optic cable splicing for payment.

(B) The Engineer will measure pullboxes per each unit basis in accordance with the contract plans.

(C) Demolition of various applicable ITS items will be paid on a lump sum basis. Measurement for payment will not apply.

279 (D) The Engineer will only measure support equipment and services
280 required and requested by the Engineer on a force account basis in
281 accordance with Subsection 109.06 – Force Account Provisions and
282 Compensation.
283

284 **647.05 Basis of Payment.** The Engineer will pay for the accepted fiber optic
285 cable underground at the contract unit price per linear foot complete in place.
286 The price includes full compensation for messenger cable both, existing and
287 new, splicing, patch panels, and all other materials required to complete a fully
288 functioning fiber optic infrastructure. submitting the equipment list and drawing;
289 furnishing, installing, splicing and taping the cable, as required; making the
290 connections; providing turn-on service, restoring pavements and other
291 improvements; testing and furnishing equipments, tools, labor, materials and
292 other incidentals necessary to complete the work. Actual amount paid to the
293 Contractor for force account work according to Subsection 109.06 Force Account
294 Provisions and Compensation.
295

296 The Engineer will make payment under:
297

298 Pay Item	299 Pay Unit
300 Type "B" Pullbox	301 Each
302 ITS _____ Fiber Optic Cable	303 Lin. Ft.
304 ITS _____ Innerduct	305 Lin. Ft.
306 ITS Ductline _____, Concrete Encased	307 Lin. Ft.
308 ITS Demolish _____	309 Lump Sum
310 Support Equipment and Services	311 Force Account"
312	
313	
314	
315	

END OF SECTION

SECTION 650 – CURB RAMPS

Make the following amendments to said Section:

(I) Amend **650.04 – Measurement** by revising lines 41 to 42 to read as follows:

650.04 Measurement.

(A) The Engineer will measure accepted curb ramps per each in accordance with the contract documents.”

(II) Amend **650.05 – Payment** by revising lines 45 to 51 to read as follows:

650.05 Payment.

(A) The Engineer will pay for the accepted curb ramps at the contract unit price per each. Payment will be full compensation for the work prescribed in this section and the contract documents.

The Engineer will pay for the following pay item when included in the proposal schedule:

Pay Item	Pay Unit
Curb Ramp, Type _____	Each”

END OF SECTION 650

1 Make this section a part of the Standard Specifications:
2

3 **“SECTION 652 - HORIZONTAL DIRECTIONAL DRILLING**
4
5

6 **652.01 Description.** This work shall consist of furnishing and installing
7 underground pipelines using the horizontal directional drilling (HDD) method of
8 installation, also commonly referred to as directional boring or guided horizontal
9 boring.

10
11 **652.02 Materials.** Materials shall be approved by the Engineer prior to use.
12

13 **(A) HDD Pipe.** HDD pipe shall be high density polyethylene (HDPE)
14 pipe meeting the requirements of Subsection 706.10 – High Density
15 Polyethylene Pipe.
16

17 **652.03 Construction** The requirements set forth herein specify a wide range
18 of procedural precautions necessary to ensure that the very basic, essential
19 aspects of a proper directional bore installation are adequately controlled. Strict
20 adherence is required under specifically covered conditions outlined in this
21 specification. Adherence to the specifications contained herein, or the
22 Engineer’s approval of any aspect of any directional bore operation covered by
23 this specification, shall in no way relieve the Contractor of their ultimate
24 responsibility for the satisfactory completion of the work authorized under the
25 Contract.
26

27 **(A) Qualifications.** HDD installer shall have demonstrated by previous
28 experience ability to do the work. The required previous experience of the
29 Contractor shall consist of having performed a minimum of five horizontal
30 directional drill installations of 500 feet or more using 6" or greater
31 diameter pipe. The Supervisor must have at least two years directional
32 drilling experience. A competent and experienced supervisor representing
33 the Drilling Contractor shall be present at all times during the drilling
34 operations.
35

36 **(B) Submittals**

37 **(1) Work Plan.** Prior to beginning work, the Contractor shall
38 submit to the Engineer a general work plan outlining the procedure
39 and schedule to be used to execute the work. The work plan shall
40 include a list of subcontractors, a safety plan, a traffic control plan,
41 an environmental protection plan and contingency plans for
42 possible problems.
43

44 **(2) Equipment.** The Contractor shall submit specifications on all
45 directional drilling equipment to be used to ensure that the
46 equipment will be adequate to complete the work.
47

48 (3) Materials. Specifications on material to be used, including
49 pipe and method(s) for joining pipe, shall be submitted to the
50 Engineer.

51
52 (4) Qualifications. The Contractor shall submit information to
53 verify that the HDD installer meets the required qualifications
54 specified in this Section. As part of the bid submission, include
55 contact information of the responsible party for each installation
56 listed.

57
58 (5) Detailed Bore Plan. Following completion of the required
59 field exploratory work and prior to HDD installation, the Contractor
60 shall submit for approval a detailed bore plan. At a minimum, the
61 bore plan shall include pipe bell and barrel diameters, bore path
62 inside diameter, entry and exit points, entry and exit angles, any
63 horizontal bend radii, and a profile showing points of tangent and
64 curvature, vertical radii, and the depth of the bore along the
65 alignment.

66
67 (6) All submittals shall be in accordance with Section 105 –
68 Control of Work.

69
70 **(C) Equipment Requirements.**

71
72 (1) Work Included. The directional drilling equipment shall
73 consist of a directional drilling rig of sufficient capacity to perform
74 the bore and pull-back the pipe, a drilling fluid mixing and delivery
75 system of sufficient capacity to successfully complete the work, a
76 guidance system to accurately guide boring operations, and trained
77 and competent personnel to operate the system. Equipment shall
78 include a vacuum trailer to withdraw excess drilling fluid and a
79 drilling fluid cleaning system truck for mixing and recycling
80 bentonite. All equipment shall be in good, safe, operating condition
81 with sufficient supplies, materials, and spare parts on hand to
82 maintain the system in good working order for the duration of the
83 work.

84
85 (2) Drilling System.

86
87 (a) Drilling Rig. The directional drilling machine shall
88 consist of a hydraulically powered system to rotate, push,
89 and pull hollow drill pipe into the ground at a variable angle
90 while delivering a pressurized fluid mixture to a guidable drill
91 (bore) head. The machine shall be anchored to the ground
92 to withstand the pulling, pushing, and rotating pressure
93 required to complete the crossing. The hydraulic power
94 system shall be self-contained with sufficient pressure and

95
96
97
98
99
100
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137
138
139
140
141

volume to power drilling operations. The hydraulic system shall be free of leaks. The rig shall have a system to monitor and record maximum pull-backpressure during pull-back operations, and shall be grounded during drilling and pull-back operations. There shall be a system to detect electrical current from the drill string and an audible alarm, which automatically sounds when an electrical current is detected.

(b) Drill Head. The drill head shall be steerable by changing its rotation and shall provide the necessary cutting surfaces and drilling fluid jets.

(c) Mud Motors. Mud motors (where required) shall be of adequate power to turn the required drilling tools.

(d) Drill Pipe. Drill pipe shall be constructed of high quality 4130 seamless tubing, Grade D or better, with threaded box and pins. Tool joints should be hardened to 32-36 RC. Submit certified statement that the drill pipe has been inspected and is in satisfactory condition for its intended use.

(3) Guidance System. The guidance system shall be of a proven type (walkover guidance systems are not acceptable for this project) and shall be set up and operated by personnel trained and experienced with the system. If using a magnetic system, the operator shall be aware of any magnetic anomalies and shall consider such influences in the operation of the guidance system. The guidance system shall be capable of knowing, at all times during the drilling operations, the exact location (vertical, horizontal, and degree of inclination) of the drill head. The guidance system shall be accurate to 2% of the vertical depth of the borehole at sensing position at depths up to one hundred feet and accurate within 1.5 meters horizontally.

(4) Drilling Fluid (Mud) System.

(a) Mixing System. A self-contained, closed, drilling fluid mixing system shall be of sufficient size to mix and deliver drilling fluid composed of bentonite clay, potable water, and appropriate additives. The mixing system shall be able to molecularly shear individual bentonite particles from the dry powder to avoid clumping and ensure thorough mixing. The drilling fluid reservoir tank shall be of sufficient size for the work. The mixing system shall continually agitate the drilling fluid during drilling operations.

142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181
182
183
184
185
186
187
188

(b) Drilling Fluid. Drilling fluid shall be composed of clean water and an appropriate additive. Water shall be from a clean source with a pH of 8.5-10. Water of a lower pH or with excessive calcium shall be treated with the appropriate amount of sodium carbonate or equal. The water and additives shall be mixed thoroughly and be absent of any clumps or clods. No hazardous additives may be used. Drilling fluid shall be maintained at a viscosity sufficient to suspend cuttings and maintain the integrity of the bore wall. All materials, including any additives used to make up the drilling fluid, shall be approved by the Engineer prior to use.

(c) Delivery System. The mud pumping system shall have sufficient capacity and be capable of delivering the drilling fluid at a constant pressure to meet the needs of the work. The delivery system shall have filters in-line to prevent solids from being pumped into the drill pipe. Connections between the pump and drill pipe shall be relatively leak-free. Used drilling fluid and drilling fluid spilled during drilling operations shall be contained and properly disposed of. A berm, minimum of 12" high, shall be constructed and shall be maintained around drill rigs, drilling fluid mixing system, entry and exit pits, drilling fluid recycling system, and environment. Pumps and/or vacuum truck(s) of sufficient size shall be in place to convey excess drilling fluid from containment areas to storage facilities.

(5) Other Equipment.

(a) Pipe Rollers. Pipe rollers, if required, shall be of sufficient size to fully support the weight of the pipe while being hydro-tested and during pull-back operations. Sufficient number of rollers shall be used to prevent excess sagging of pipe.

(b) Pipe Rammers. Hydraulic or pneumatic pipe rammers may only be used if necessary and with the authorization of Engineer.

(c) Restrictions. Other devices or utility placement systems for providing horizontal thrust other than those previously defined shall not be used unless approved by the Engineer prior to commencement of the work. Consideration for approval will be made on an individual basis for each specified location. The proposed device or system will be evaluated prior to approval or rejection on its potential ability to complete the utility placement satisfactorily without undue

189 stoppage and to maintain line and grade within the
190 tolerances prescribed by the particular conditions of the
191 project.
192

193 **(D) Construction Requirements.**
194

195 **(1) General.** The Engineer must be notified 48 hours in
196 advance of starting work. The directional bore shall not begin until
197 the Engineer is present at the job site and agrees that proper
198 preparations for the operation have been made. The Engineer
199 approval for beginning the installation shall in no way relieve the
200 Contractor of the ultimate responsibility for the satisfactory
201 completion of the work as authorized under the Contract. The
202 Contractor is responsible for damages to utilities and repairs for
203 such damages, at no cost to the State.
204

205 **(2) Personnel.** All personnel shall be fully trained in their
206 respective duties as part of the directional drilling crew and in
207 safety.
208

209 **(3) Drilling Procedure.**
210

211 **(a) Site Preparation.** Prior to any alterations to the work
212 site, the Contractor shall photograph or video the entire work
213 area, including entry and exit points, one copy of which shall
214 be provided to the Engineer and one copy to remain with the
215 Contractor for a period of 1 year following the completion of
216 the project.
217

218 Work site, as indicated on the Plans, within right-of-way,
219 shall be graded or filled to provide a level working area. The
220 Contractor is responsible for design and construction of the
221 drill entrance and exit pits. No alterations beyond what is
222 required for operations are to be made. The Contractor shall
223 confine all activities to designated work areas.
224

225 Prior to anchoring the drilling rig to the ground, the
226 Contractor shall confirm locations of all underground utilities
227 in the area of the drilling rig.
228

229 **(b) Drill Path Survey.** The entire drill path shall be
230 accurately surveyed, with entry and exit stakes placed in the
231 appropriate locations within the areas indicated on the Plans.
232 If the Contractor is using a magnetic guidance system, the
233 drill path will be surveyed for any surface geo-magnetic
234 variations or anomalies.
235

236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
273
274
275
276
277
278
279
280
281
282

(c) Environmental Protection. The Contractor shall place silt fence between all drilling operations and any drainage, wetland, waterway, or other area designated for such protection by the Contract Documents or state, federal, and local regulations. Additional environmental protection necessary to contain any hydraulic or drilling fluid spills shall be put in place, including berms, liners, turbidity curtains, and other measures. Disposal of fluids is the responsibility of the Contractor. The Contractor shall adhere to all applicable environmental regulations. Fuel or oil may not be stored in bulk containers within 200 feet of any water body or wetland.

(d) Safety. The Contractor shall adhere to all applicable state, federal, and local safety regulations and all operations shall be conducted in a safe manner. Safety meetings shall be conducted at least weekly written record of attendance and topic submitted to the Engineer.

(e) Pilot Hole. The pilot hole shall be drilled on the bore path with no deviations greater than 5% of depth over a length of 100 feet. In the event the pilot hole does deviate from the bore path more than 5% of depth in 100', the Contractor will notify the Engineer and the Engineer may require the Contractor to pull-back and re-drill from the location along the bore path before the deviation.

In the event that a drilling fluid fracture, inadvertent returns, or returns loss occurs during pilot hole drilling operations, the Contractor shall cease drilling, wait at least 30 minutes, inject a quantity of drilling fluid with a viscosity exceeding 120 seconds as measured by a March funnel, and then wait another 30 minutes. If mud fracture or returns loss continues, the Contractor will cease operations and notify the Engineer. The Engineer and the Contractor will discuss additional options and work will then proceed accordingly. Return the surface area to its original condition.

(f) Reaming. Upon successful completion of the pilot hole, the Contractor will ream the bore hole to a minimum of 25% greater than the outside diameter of the pipe using the appropriate tools. The Contractor will not attempt to ream at one time more than the drilling equipment and mud system are designed to safely handle.

(g) Pull-Back. After successfully reaming the bore hole to the required diameter, the Contractor will pull the pipe

283 through the bore hole. Pipe lengths shall be connected
284 together in one length, if space permits. Pipe shall be
285 placed on rollers with rollers spaced close enough to prevent
286 excessive sagging of pipe. In front of the pipe will be a
287 swivel. Once pull-back operations have commenced,
288 operations must continue without interruption until the pipe is
289 completely pulled into the bore hole. During pull-back
290 operations, the Contractor will not apply more than the pipe
291 manufacturer's maximum safe pipe pull pressure at any
292 time. In the event that the pipe becomes stuck, the
293 Contractor will cease pulling operations to allow any
294 potential hydro-lock to subside and will commence pulling
295 operations. If the pipe remains stuck, the Contractor will
296 notify the Engineer. The Engineer and the Contractor will
297 discuss options and then work will proceed accordingly.
298

299 **(h) Inlet Grouting.** Upon completion of installation, the
300 excess pipe shall be removed and the bore hole shall be
301 filled with flowable fill or cement grout as directed by the
302 Engineer.
303

304 **(E) Site Restoration.** Following drilling operations, the Contractor will
305 de-mobilize equipment and restore the work-site to original condition. All
306 excavations will be backfilled and compacted to 95% of the maximum dry
307 unit weight determined in accordance with AASHTO T 180. Landscaping
308 will be restored to original to the satisfaction of the Engineer.
309

310 **(F) Record Keeping, As-Builts.** The Contractor shall maintain a daily
311 project log of drill operations and a guidance system log with a copy given
312 to the Engineer at completion of the work. As-built drawings shall be
313 certified as to accuracy by the Contractor.
314

315 **652.04 Method of Measurement.** The communication ductlines will be paid
316 on a lump sum basis. Measurement for payment will not apply.
317

318 **652.05 Basis of Payment.** The Engineer will pay for the accepted pay item
319 below at the contract lump sum basis. Payment will be full compensation for the
320 work prescribed in this section and the work prescribed in this section and the
321 contract documents. Payment shall be full compensation for furnishing all labor,
322 tools, equipment, and materials; for excavation, sheeting and bracing, de-
323 watering, and backfilling; for furnishing and installing the HDD pipe and carrier
324 pipe utilizing horizontal directional boring method of installation; for furnishing
325 and installing pipe spacers and end seals; for restoration of physical features;
326 and for all work required for a complete installation of the highway crossing
327 including clearing, grubbing, erosion control, excavation, excavation support,
328 dewatering, drilling, removal of tailings, backfilling, compaction, and flushing; for
329 preparing and furnishing required submittals, reports, and as-built drawings; and

330 for furnishing all labor, materials, tools, equipment, and incidentals necessary to
331 complete the work.

332

333 The Engineer will pay for the following pay item when included in the
334 proposal schedule:

335

336 **Pay Item**

Pay Unit

337

338 AT&T One 6-Inch Conduit Encased in Concrete Jacket
339 with Four 1.5-Inch Inner Ducts - _____,

340 Horizontal Directional Drilling

Lump Sum

341

342

343

344

END OF SECTION 652

345

346

1 **SECTION 655 – DUMPED RIPRAP**

2
3 Make the following amendments to said Section:

4
5 **(I)** Amend **655.02 – Materials** by revising line 9 to read as follows:

6
7 “Geotextiles for Stabilization Applications 716.06”

8
9 **(II)** Amend **655.04 – Measurement** by revising lines 34 to 35 to read as
10 follows:

11
12 **“655.04 Measurement.** The Engineer will measure dumped riprap per cubic
13 yard in accordance with contract documents.”

14
15 **(III)** Amend **655.05 – Payment** by revising lines 37 to 45 to read as follows:

16
17 **“655.05 Payment.** The Engineer will pay for the accepted dumped riprap per
18 cubic yard. Payment will be full compensation for the work prescribed in this
19 section and contract documents.

20
21 The Engineer will pay for following pay item when included in the proposal
22 schedule:

Pay Item	Pay Unit
Dumped Riprap	Cubic Yard”

23
24
25
26
27
28 **END OF SECTION 655**

1 Add **Section 660 – Gas System** in its entirety to the specifications:

2
3 **“SECTION 660 - GAS SYSTEM**

4
5 **660.01 Description.** This section describes constructing gas systems.

6
7 **660.02 Materials.**

8
9 Trench Backfill Material 703.21

10
11 **660.03 Construction.**

12
13 **(A) General.** Notify Hawaii Gas in writing at least one month (30 calendar
14 days) before commencement of work of gas system.

15
16 Invert grades of gas pipelines shall provide a minimum of three feet
17 cover from top of pipe to finish grades.

18
19 Minimum vertical and horizontal clearance between the gas pipelines
20 and other pipelines, conduits, ductlines, or other facilities shall be 12 inches.

21
22 **(B) Trench Excavation.**

23
24 **(1) General.** Pile excavated material next to trench, or haul and
25 store to site acceptable to the State Engineer.

26
27 In fill areas, compact fill to subbase or to elevation 4 feet above
28 top of pipe, whichever is less, before excavating trench.

29
30 Excavate trenches in accordance with Section 204 –
31 Excavation and Backfill for Miscellaneous Facilities, and as modified
32 below.

33
34 Do not construct trench with jumps or spaces unless
35 acceptable to the State Engineer. Maintain excavation during
36 installation of gas systems and placing of backfill.

37
38 Construct trench widths for various size pipes in accordance
39 with the Construction Plans.

40
41 Correct trenches over-excavated below specified grade with
42 trench backfill material, compacted, at no increase in contract price or
43 contract time.

44
45 **(2) Removal of Mud and Other Unsuitable Material from**
46 **Trench Bottom.** If soft, spongy, or other unsuitable material is

47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92

encountered at specified depths, remove material under pipe to maximum depth of 30 inches below invert grade of pipe. Backfill space to 6 inches below invert grade of pipe with untreated base. Use untreated base with maximum aggregate size of 1-1/2 inches. Compact untreated base until relative compaction is not less than 95 percent.

(3) Sheathing. Properly sheath and brace excavation to provide secure excavation. Remove sheathing and bracing before completing backfill. When sheathing is necessary, widen trench beyond those widths specified in Subsection 624.03(B)(1) - General. Follow OSHA requirements.

(4) Dewatering. Keep trenches free from water while installing and testing pipe and backfilling trench. Comply with NPDES requirements and other applicable regulations. Obtain NPDES construction dewatering permit for discharge of uncontaminated ground water.

(5) Use of Explosives. The use of explosives is not permitted, in accordance with Subsection 104.10 – Use of Explosives.

(C) Trench Backfill.

(1) General. Do not use adobe, clay or material of similar nature for backfill. When removal of unsuitable excavated materials creates shortage of backfill material, furnish suitable material. Material from roadway or other excavation may be used.

(2) Preparation of Trench Bottom. After excavating trench to proper depth below invert grade of pipe, backfill trench bottom to required invert grade of trench with trench backfill material.

(3) Backfilling. Upon completion of installation and testing of pipelines by Hawaii Gas, conform to following:

(a) Backfill trench widths in accordance with the Construction Plans.

(b) Backfill remainder of trench with trench backfill material, conforming to Subsection 703.21 – Trench Backfill Material.

(c) Place trench backfill materials in layers not exceeding six inches in loose thickness. Compact each layer to not less than 95 percent relative compaction conforming to Subsection 203.03(C)(2) Relative Compaction Test.

93
94
95
96
97
98
99

100
101
102
103
104
105

106
107
108
109
110
111
112
113
114
115
116

(D) Laying Pipe. Gas pipelines shall be provided and installed by Hawaii Gas.

660.04 Measurement. Gas system will be paid on a force account basis in accordance with Subsection 109.06 – Force Account Provisions and Compensation. Measurement for payment will not apply.

660.05 Payment. The Engineer will pay for the fee for the Installation of Gas Pipeline on a force account basis in accordance with Subsection 109.06 – Force Account Provisions and Compensation. Payment will be full compensation as prescribed in this section and contract documents. The actual amount to be paid will be the sum shown on the accepted force account records whether this sum be more or less than the estimated amount allocated in the proposal schedule.

Pay Item	Pay Unit
Allowance for Installation of Gas Pipeline	Force Account

The Engineer will pay for excavation and backfill for gas pipelines under Section 204 – Excavation and Backfill for Miscellaneous Facilities.

END OF SECTION 660”

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

2
3 **“SECTION 670 - GLASS FIBER REINFORCED POLYMER REBAR**

4
5 **670.01 Description.** This work includes the furnishing and placing of Glass
6 Fiber Reinforced Polymer (GFRP) Rebar according to the contract.

7
8 **670.02 Materials.** Materials and construction for the GFRP rebars shall
9 conform to ASTM D 7957, ACI 440.1 R-01 “Guide for the Design and
10 Construction of Concrete Reinforced with FRP Bars” and AASHTO “LRFD Bridge
11 Design Guide Specifications for GFRP – Reinforced Bridge Deck and Traffic
12 Railings.” GFRP rebars shall also meet the following conditions and properties:

13
14 Tensile Strength: 110,000 psi, min. for #4 bar; 105,000 psi min. for
15 #5 bar.

16
17 Modulus of Elasticity: 6,500,000 psi, min.

18
19 Barcol Hardness: 60 min.

20
21 Bond stress between the rebar and concrete shall exceed 1500 psi.

22
23 Glass content by weight: 70% min. Per ASTM D2584.

24
25 Allowable tensile stress: 25% of minimum ultimate tensile strength.

26
27 The product shall be non-magnetic, non-conducting and corrosion
28 resistant. The use of ferrous materials is prohibited. The product shall exhibit
29 chemical resistance to salts, acids and concrete chemistries.

30
31 **(A)** Materials shall be obtained from a manufacturer regularly engaged
32 in the production of GFRP rebars. Six copies of the manufacturer’s
33 brochures shall be submitted.

34
35 **(B)** A copy of the manufacturer’s Quality Assurance Manual shall be
36 provided prior to delivery of any product to the site.

37
38 **(C)** Tensile test reports from the manufacturer shall be provided for
39 every 3,000 feet of product supplied in accordance with ASTM D-3916-84.

40
41 **(D)** Assigned Lot traceability numbers from the manufacturer with each
42 shipment shall be provided. These numbers shall change with each
43 production shift.

44
45 **(E)** Daily resin impregnation test results shall be provided at the
46 request of the Engineer.

47
48 **(F)** Certified test results of material properties shall be provided.

49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95

670.03 Construction Requirements.

(A) General.

(1) Straight Bars. All GFRP reinforcing bars shall consist of uniformly pretensioned continuous longitudinal fibers encapsulated in the matrix material. The outer surface shall be deformed by a helical wrap of glass and sand coating providing a mechanical bond between the bar and concrete. The GFRP reinforcing bars shall not be cut or taken from the production line until an initial curing state has been reached and the bars exhibit dimensional stability.

(2) Fabricated Bends. All bends shall be fabricated in the factory and straight thermal curing shall not take place until all fabrication has been completed. Such fabrication shall always be executed with the use of molds. Each radius shall transfer no less than 40% of ultimate tensile strength. ACI 318 minimum radius shall be adhered to unless otherwise permitted by the Engineer. Field bends shall not be permitted.

(B) Installation. The product shall be field cut with masonry blades. A dust mask or other suitable protection shall be used during the cutting process. Due to the rebar's very low specific gravity, it may tend to float in concrete during vibration; therefore, care should be exercised to adequately secure GFRP in formwork using chairs, plastic coated wire ties or nylon zip ties.

(C) Order Lists and Bending Diagrams. The Contractor shall submit six (6) copies of the GFRP rebars order lists and bending diagrams to the Engineer. The Contractor shall be wholly and completely responsible for the accuracy of the lists and diagrams.

(D) Storage, Surface Condition and Protection of Reinforcement. The Contractor shall store the GFRP rebars above the surface of the ground upon platforms, skids, or other supports. GFRP rebars shall be covered to protect them from ultraviolet exposure, high temperatures, and chemical substances. The Contractor shall protect the GFRP rebars from other surface damage. The GFRP rebars shall be free of mortar, oil, dirt, and other coatings that would destroy or reduce the bond. GFRP rebar shall not be dropped on the ground by workers at any time. The GFRP rebars shall also be free from injurious defects including cracks and laminations.

670.04 Measurement. The Engineer will not measure GFRP bars for payment.

96 **670.05 Payment.** The Engineer will not pay for the accepted GFRP bars
97 separately. The Engineer shall consider the cost for the accepted GFRP bars as
98 included in the contract price of the various contract items. The cost is for the
99 work prescribed in this section and the contract documents.”

100

101

102

END OF SECTION 670

1 Make this Section a part of the Standard Specifications:
2

3 **SECTION 675 – MASS CONCRETE**
4

5 **675.01 Description.** This Section describes mass concrete, which is the placement
6 of any large volume of cast-in-place concrete with dimensions large enough to
7 require taking measures to cope with the generation of heat from hydration of
8 cement and attendant volume change.
9

10 **675.02 Materials.**

11		
12	Portland Cement	701.01
13		
14	Fine Aggregate for Concrete	703.01
15		
16	Coarse Aggregate for Portland Cement Concrete	703.02
17		
18	Admixtures	711.03
19		
20	Water	712.01
21		

22
23 **675.03 Construction.**

24
25 **(A) Submittals.**

26
27 **(1)** At least 14 days prior to the mass concrete pour, submit a Thermal
28 Control Plan prepared by a specialty Engineer with at least 5 years of
29 experience in the design and temperature control of mass concrete.
30 The plan shall follow ACI 207.1R “Guide to Mass Concrete” and also
31 address the following issues:
32

33 **(a)** An analysis of anticipated thermal developments within the
34 mass pour placements using proposed materials and casting
35 methods. List locations of anticipated mass concrete pours,
36 type of structure, and anticipated volume of concrete
37

38 **(b)** A plan which includes mix design, insulation and cooling
39 outlining specific measures to be taken to control the
40 temperature differential and the maximum temperature
41

42 **(c)** The proposed monitoring system
43

44 **(d)** Duration and method of curing
45

46 (e) An outline of corrective actions to maintain the temperature
47 differential and the maximum temperature to avoid cracking

48
49 (f) Proposed methods of repairs or corrective actions if the
50 mass concrete member is not accepted as well as preventative
51 measures to ensure issues do not reoccur

52
53 (2) Drilled shaft concrete heat of hydration development shall be
54 addressed independently from the Thermal Control Plan considering
55 ambient ground conditions and range of expected placement
56 temperatures to ensure conformance with the maximum temperature
57 limit and gradients set forth herein.

58
59 **(B) Quality Control.** Mass Concrete production requires Contractor
60 responsibility for quality control of materials during handling, blending, mixing,
61 curing, and placement operations.

62
63 Sample, test, and inspect concrete to ensure quality control of
64 component materials and concrete. Sampling and testing for quality control in
65 accordance with standard methods shall be performed by certified ACI
66 Concrete Field Technician Grade I. Perform quality control tests for slump,
67 air content, temperature, and unit weight during production of mass concrete
68 other than concrete for incidental construction. Submit quality control test
69 results.

70
71 Cease all mass placement operations and revise the Thermal Control
72 Plan as necessary if either the maximum core temperature or maximum
73 differential temperature is exceeded.

74
75 If any mass concrete placed under these Specifications proves
76 unsatisfactory, the Contractor will be required to make the necessary repairs
77 or to remove and replace the material at the Contractor's expense.

78
79 The Engineer will be the sole judge in determining the acceptance of a
80 mass concrete member. Corrective actions, as approved in the Thermal
81 Curing Plan Report, shall be made in those areas directed by the Engineer
82 before the mass concrete member will be considered for acceptance.

83
84 **(C) Pre-Operational Conference.** Schedule a meeting with the Contractor,
85 and suppliers representatives involved in construction operation of the mass
86 concrete and the Engineer, at a mutually agreed time, to discuss and verify the
87 methods of accomplishing all phases of the mass concrete operations,
88 contingency planning, and standards of workmanship for the completed items
89 of work. Include the Contractor's superintendents, foremen, subcontractors,
90 and supplier's technical representatives, and all key personnel involved with
91 the mass concrete work as attendees of the pre-operation conference. Do not

92 begin placement of mass concrete before the Engineer accepts the pre-
93 operational conference as completed.

94
95 **(D) Just-In-Time Training.** JITT shall conform to Section 695 – JUST IN
96 TIME TRAINING.

97
98 **(E) Mix Design.** The specialty Engineer shall select the concrete mix
99 proportions that will generate the lowest maximum temperature possible to
100 ensure that no Delayed Ettringite Formation (DEF) will occur and also the
101 lowest temperature differential to ensure there will be no thermal cracking.
102 Mass concrete shall conform to the provisions in Section 601 – Structural
103 Concrete with the following exceptions:

104
105 **(1)** Select concrete ingredients, e.g., aggregates, gradation,
106 admixtures, and cement types that minimize the heat of hydration.

107
108 **(2)** Cementitious Material: Mass concrete shall contain a minimum of
109 505 pounds of cementitious material per cubic yard of concrete. To
110 better control the heat of hydration of the mass concrete, the concrete
111 mix design shall contain a pozzolanic material such as fly ash, silica
112 fume, or ground granulated blast furnace slag (GGBFS). GGBFS shall
113 be compliance with ASTM C989. The minimum amount of fly ash or
114 natural pozzolan shall be the weight of the total amount of cementitious
115 material.

116
117 **(a)** When supplementary cementitious (SCM) material is
118 GGBFS, the amount of SCM shall be 50 to 75 percent by weight
119 of the total cementitious material used in the mix. When the
120 SCM is not GGBFS, the SCM content shall be from 25 to 35
121 percent by weight of the total cementitious material used in the
122 mix.

123
124 **(3)** Temperature Sensing Equipment: Use thermistor-type
125 temperature-sensing devices or an approved equal capable of
126 indicating temperatures over a range of 50 to 200 degrees Fahrenheit,
127 with an accuracy and precision of ± 1 degree Fahrenheit. Connect the
128 sensors to a device that continuously records and displays
129 temperatures and produces a record that can be detached and filed.

130
131 **(F) Monitoring and Controlling Temperature.**

132
133 **(1)** Thermally cure the concrete in order to maintain a temperature
134 differential between the internal (hottest: located as close as possible
135 to the center of the pour but not less than 12 inches from the surface)
136 and external (coolest temperature of the concrete) of 35 degrees
137 Fahrenheit maximum. In addition, the internal temperature of the

138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181
182

concrete (measured at the hottest point located at the center of the pour) shall at no time exceed 160 degrees Fahrenheit. The Contractor may submit a mix design that is outside of these temperature parameters if the analysis shows no signs of thermal cracking or Delayed Ettringite Formation (DEF). The Engineer will be the sole judge in determining the acceptance of the newly proposed temperature requirements.

(2) Use a combination of the following elements to thermally cure the concrete to maintain internal and differential temperature:

- (a)** Use of shaved, flaked, or chipped ice or other concrete cooling ingredients
- (b)** Use of liquid nitrogen dosing systems
- (c)** Controlling the rate or time of concrete placement
- (d)** Using insulation or supplemental external heat to control heat loss
- (e)** Using supplementary cementing materials or additives that will reduce heat of hydration without affecting strength or durability
- (f)** Using a mechanical cooling system
- (g)** Using a cooling system to control the core temperature
- (h)** Other methods accepted by the Engineer

(3) Provide temperature monitoring devices to record temperature development between the interior and exterior of the element at points approved by the Engineer, and shall monitor the mass pours to measure temperature differentials. Temperature monitoring shall continue until the interior temperature is within 35 degrees Fahrenheit of the lowest ambient temperature, and when the interior temperature has plateaued and is decreasing.

- (a)** Furnish and install a temperature monitoring and recording system. This system shall consist of temperature sensors and a data acquisition system. Use these devices to simultaneously measure and record the temperature of the concrete at the core, the surface, and the ambient temperature within 12 inches of the concrete pour. The Engineer may adjust the locations for all

183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199
200
201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218
219

temperature sensors from those stated in the Contractor's Thermal Control Plan.

(b) Record each set of readings as they are taken and make a temperature chart for each mass pour element showing temperature readings vs. time. The temperature chart showing temperature differential shall have both the interior temperature and ambient temperatures on the same chart. Submit to the Engineer the readings and chart. If the temperatures indicate temperatures are trending toward non-compliant temperatures immediately inform the Engineer and take action as presented in the Thermal Control Plan. Record the temperature readings hourly or more frequently. The Engineer may change the recording frequency of the reading at any time.

(c) Methods of concrete consolidation and placement shall prevent damage to the temperature monitoring and recording system. Wiring from temperature sensors cast into the concrete shall be protected to prevent movement. Wire runs shall be kept short as possible. The ends of the temperature sensors shall not come into contact with concrete form or with bar reinforcing steel or casing.

(4) If monitoring indicates that the proposed measures are not controlling the concrete temperature differential within the 35 degrees Fahrenheit specified, implement corrective actions as presented in the Thermal Curing Plan to maintain the temperature differential.

675.04 Measurement. The Engineer will measure mass concrete as concrete used in other sections in accordance with that other applicable sections.

675.05 Payment. The Engineer will pay for the accepted mass concrete as concrete used in other sections as concrete under that other applicable sections.”

END OF SECTION 675

1 This Section shall be made a part of the Standard Specifications:
2

3 **SECTION 680 - ELECTRIC AND COMMUNICATION SYSTEMS**
4

5 **680.01 Description.** This work shall consist of furnishing all labor, materials and
6 equipment to install in place and in operating condition underground structures required
7 for the facilities of Hawaiian Electric, herein referred to as HE, the facilities of Hawaiian
8 Telcom herein referred to as HT, AT&T Corporation hereinafter referred to a AT&T, and
9 the facilities of Spectrum Oceanic herein referred to as CATV. Such works shall be
10 performed and tested at the indicated locations in accordance with the requirements
11 herein specified and the indicated details, or as ordered by the Engineer, and includes
12 but is not limited to the following.
13

14 **(A)** Complete underground duct system extension including excavation,
15 backfilling, concrete work, conduits, handholes, and manholes, to be used in the
16 future by HE for their cables and equipment. Work shall also include securing the
17 approval of the HE inspector.
18

19 **(B)** Complete underground duct system extension including excavation,
20 backfilling, concrete work, conduits, handholes, and manholes to be used in the
21 future by HT for their cables and equipment. Work shall also include securing the
22 approval of the HT inspector.
23

24 **(C)** Complete underground duct system extension including excavation,
25 backfilling, concrete work, conduits, handholes and manholes, to be used in the
26 future by CATV for their cables and equipment. Work shall also include securing
27 the approval of the CATV inspector.
28

29 **(D)** Complete underground duct system extension including excavation,
30 backfilling, concrete work, conduits and pullboxes, to be used in the future by AT&T
31 for their cables and equipment. Work shall also include securing the approval of
32 the AT&T inspector.
33

34 **(E)** Coordinate work and arrange for periodic inspections by HE, HT, AT&T,
35 CATV and Engineer.
36

37 **(F)** Provide warning tape above utility ductlines in accordance with the
38 respective standard specifications of the respective utility companies and as
39 indicated on the contract drawings.
40

41 **(G)** Pass test mandrel through all ducts and conduits, and make corrections as
42 directed by the utility inspectors or Engineer.
43

44 **(H)** Provide pulling wire, polypropelene cord, in all empty ducts and conduits,
45 unless indicated otherwise. Provide duct measuring/cable pulling tape in all HT
46 ducts and conduits.
47

48 (I) Immediately report and pay for damages to existing equipment and existing
49 utility installations.

50
51 (J) Obtain and pay for electrical permits, arrange for periodic inspection by local
52 authorities and deliver certificate of final inspection to Engineer.

53
54 (K) Contractor shall check and test the installation for completeness and
55 functional operation as described by the drawings and specified herein. Final test
56 shall be in the presence of Engineer and representatives of utility companies.
57 Contractor shall arrange and pay for all testing costs.

58
59 (1) Incidental parts which are not shown on the plans or specified herein
60 and which are necessary to complete the underground electric, telephone,
61 and cable television duct systems shall be furnished and installed by the
62 Contractor as though such parts were shown on the plans, or specified
63 herein or in the special provisions.

64
65 (2) All electrical equipment shall conform to the NEMA Standards, and
66 all electrical work shall conform to ordinances of City and County of
67 Honolulu; latest edition of National Electrical Code; Title 6, Chapter 37,
68 Hawaii Administrative Rules, State of Hawaii; and Regulations and
69 Standard Practices of HE, HT, AT&T, and CATV.

70
71 (L) Applicable rules, standards and specifications of following associations
72 shall apply to materials and workmanship:

73
74 (1) American National Standards Institute (ANSI)

75
76 (2) Edison Electric Institute (EEI)

77
78 (3) Illumination Engineer Society (IES)

79
80 (4) National Board of Fire Underwriters (NBFU)

81
82 (5) National Electrical Manufacturer's Association (NEMA)

83
84 (6) National Fire Protection Association (NFPA)

85
86 (7) Underwriters' Laboratories, Inc. (UL)

87
88 **680.02 Materials.**

89
90 (A) Materials shall meet the requirements specified in the following subsections
91 of Division 700 - Materials.

92
93 Concrete Pull Box 712.06(B)

94

96
97 **(B)** Ducts and Conduits shall conform to the requirements of Section 712.27 -
98 Conduits. Ducts and conduits required shall be new and provided by the
99 Contractor in accordance with the construction drawings and specifications.

100
101 **(1)** Polyvinyl Chloride (PVC) Schedule 40 type ducts shall be provided
102 for the HE, HT, and CATV duct systems. The fittings shall be of the same
103 material as the conduit and duct.

104 **(2)** High-Density Polyethylene (HDPE) SDR 11 Type duct casing,
105 designed for directional boring use, shall be provided for the AT&T duct
106 systems when installed via trenchless directional boring.

107
108 **(a)** Duct lengths shall be 20'-0".

109 **(b)** Joints shall be secure, water-proof without the use of solvent
110 cement.

111 **(c)** Product shall be CAN-LOC Directional Boring Conduit as
112 manufactured by CANTEX INC. or approved equivalent.

113 **(3)** High-Density Polyethylene (HDPE) SDR 11 Type innerduct.
114

115 **(C) Fluidized Thermal Backfill.** Submit concrete mix designs using State
116 Highways Division form DOT 4-151. Fluidized thermal backfill shall meet the
117 following requirements:
118

119 The proportions for the following mix designs shall be in accordance with
120 the guidelines of ACI 211 and ASTM C94 "Standard Specification for Ready Mix
121 Concrete, Option B". The mixes may be modified to maintain yield, slump, setting
122 time and strength. Prior to unloading, a maximum of two gallons of water per cubic
123 yard, may be added, provided that the specification limits for slump and time are
124 not exceeded. Reinforced masonry group proportions are selected from
125 compression test results per ASTM C 1019, "Standard Method of Sampling and
126 Testing Grout".
127

Material	Fine Agg	Fine Agg	Course Agg
Type	Orca Stratum	Conc. Sand	#3 Fine
Source	B C-Basalt	Kapaa-Basalt	Kapaa-Basalt
Spec	ASTM C-33	ASTM C-33	ASTM C-33

Material	Course Agg	Cement	Water
Type	3/8" Pea Gravel	I / II	Water
Source	Kapaa-Basalt	Hawaiian	City-Water
Spec	ASTM C-33	ASTM C-150	ASTM C-1602

128
129
130 Weight in LBS Per Cubic Yard (SSD)
131 Mix: Fluidized Thermal Backfill 150 psi

Material Type	Sp. G	Volume (ft3)	XX67HE04
Slump			8" ± 1"
Cement	3.15	0.59	115 lb
Orca Stratum	2.75	5.54	950 lb
Conc. Sand	2.65	3.27	540 lb
#3 Fine	2.70	7.89	1330 lb
3/8" Pea Gravel	2.70	3.01	507 lb
Water	1.00	6.28	47.0 gal
Air		0.40	1.5%

133

134

135

136

137

138

(1) Fluidized Thermal Backfill design mix shall be coordinated with Geotherm, Inc. (21239 FM529 Rd, Bldg F Cypress, Texas 77433, telephone (281) 985-9344, fax (925) 999-8837) to ensure that the design thermal rho will be acceptable.

139

140

141

142

143

144

145

146

147

(2) In addition to the normal testing, two standard compression test cylinders shall be made from each design mix of the Fluidized Thermal Backfill. The test cylinders shall be made using the normal methods except each shall contain a special heater and thermocouple device properly located for the purpose of testing the thermal rho of the Fluidized Thermal Backfill. The special devices, laboratory testing, and consultation costs shall be paid by the Contractor and shall be purchased from Geotherm, Inc. Shipping costs shall be paid by the Contractor.

148

149

150

151

152

153

154

155

156

(D) Submit concrete mix design using State Highways Division form DOT 4-151. Concrete shall conform to the requirements of Section 601 - Structural Concrete, except that for concrete jackets and concrete caps, the maximum size of coarse aggregate shall be 3/4 inch in lieu of the one-inch to No. 4 specified and the slump shall be 6-inch minimum and 7-inch maximum. Concrete for manholes, handholes, and pullboxes shall be Class A. Concrete for jacketing conduits and ducts shall be Class B except that the cement content shall be 5.6 sacks per cubic yard.

157

158

159

160

(E) **Thermal Concrete (Class II Mix).** Submit concrete mix design using State Highways Division form DOT 4-151. Thermal concrete shall meet the following requirements:

161

162

163

164

(1) Class II design mix shall be coordinated with Geotherm, Inc. (21239 FM529 Rd, Bldg F Cypress, Texas 77433, telephone (281) 985-9344, fax (925) 999-8837) to ensure that the design thermal rho will be acceptable.

165

166

167

168

169

170

(2) In addition to the normal testing, two standard compression test cylinders shall be made from each design mix of the Class II concrete for the purpose of determining the thermal rho characteristics of the concrete. The test cylinders shall be made using the normal methods except each shall contain a special heater and thermocouple device properly located for the purpose of testing the thermal rho of the concrete. The special devices,

171 laboratory testing, and consultation costs shall be paid by the Contractor
 172 and shall be purchased from Geotherm, Inc. Shipping costs shall also be
 173 paid by the Contractor.
 174

175 **(3)** The proportions for the following mix designs shall be in accordance
 176 with the guidelines of ACI 211 and ASTM C94 "Standard Specification for
 177 Ready Mix Concrete, Option B". The mixes may be modified to maintain
 178 yield, slump, setting time and strength. Prior to unloading, a maximum of
 179 two gallons of water per cubic yard, may be added, provided that the
 180 specification limits for slump and time are not exceeded. Reinforced
 181 masonry group proportions are selected from compression test results per
 182 ASTM C 1019, "Standard Method of Sampling and Testing Grout".
 183

Material	Fine Agg	Fine Agg	Course Agg	Course Agg
Type	Orca Stratum	Conc. Sand	#3 Fine	3/8" Pea Gra
Source	B C-Basalt	Kapaa-Basalt	Kapaa-Basalt	Kapaa-Basalt
Spec	ASTM C-33	ASTM C-33	ASTM C-33	ASTM C-33

184

Material	Cement	Water	Admix	Admix
Type	I / II	Water	MASTERPOZ ZOLITH 322	MASTERSET DELVO
Source	Hawaiian	City-Water	BASF-A	BASF-B
Spec	ASTM C-150	ASTM C-1602	ASTM C-494	ASTM C-494

185

186 Weight in LBS Per Cubic Yard (SSD)
 187 Mix: 3,000 PSI-3/4" Pump
 188

Material Type	Sp. G	Volume (ft3)	3067HE04
Slump			6" ± 1"
Cement	3.15	3.28	645 lb
Orca Stratum Sand	2.75	4.87	835 lb
Conc. Sand	2.65	2.39	395 lb
#3 Fine	2.70	8.16	1375 lb
3/8" Pea Gravel	2.70	2.82	475 lb
Water	1.00	5.08	38.0 gal
MASTERPOZZOLITH 322			19-45 lq oz
MASTERSET DELVO			0-45 lq oz
Air		0.41	1.5%

189

190

191 **(F)** Concrete Bricks shall conform to Subsection 704.02 - Concrete Brick. The
 192 use of broken bricks will not be permitted.
 193

194

195 **(G)** Cement Mortar for Setting Bricks shall conform to the requirements of
 196 Section 601 - Structural Concrete. Submit concrete mix designs using State
 Highways Division form DOT 4-151. Cement mortar shall be a one-to-three

197 volumetric mix of portland cement and a combined fine aggregate. Combined fine
198 aggregate shall conform to Section 703 - Aggregates.

199
200 **(H)** Concrete Covers, Steel Frames and Miscellaneous Metals and
201 Appurtenances for Handholes and Manholes. Steel shapes shall conform to the
202 applicable provisions of Section 713 - Structural Steel and Related Materials.
203 Fabrication of steel frames shall conform to the applicable provisions of Section
204 501 - Steel Structures. Steel frames shall be hot-dipped galvanized after
205 fabrication. Concrete for covers shall be Class A and shall conform to Section
206 601 - Structural Concrete. Cast iron frame and cover shall conform to Subsection
207 712.07 (A) - Frame and Covers.

208
209 **(I) Reinforcing Steel.** Reinforcing Steel for manholes, handholes and
210 pullboxes, and concrete jackets shall conform to the requirements of Section
211 602 - Reinforcing Steel.

212
213 **(J)** Materials will be subject to inspection at any time. Failure of the Engineer
214 to note faulty material or workmanship during construction will not relieve the
215 Contractor of his responsibility for removing or replacing such materials and
216 dredging the work at his expense.

217
218 **680.03 Construction.**

219
220 **(A) General.**

221
222 **(1)** The Contractor shall in performing required excavation and backfill,
223 exercise due care to avoid disturbing existing facilities. He shall remove
224 and dispose of all demolished or excess material from the job site.

225
226 **(2)** Upon completion of the work, the Contractor shall submit an 'As Built'
227 or corrected plan showing in detail thereon all construction changes.

228
229 **(3)** Before bidding, the Contractor shall visit project site, carefully review
230 each section of the Specification and all Drawings of this Contract, and
231 obtain and review the standards, specifications and drawings of the local
232 utility companies.

233
234 **(a)** The Contractor shall report any error, conflicts or omissions
235 to the Engineer at least one week before submission of bids for
236 interpretation or clarification. If errors or omissions are not reported,
237 the Contractor shall provide necessary work at no cost to the State
238 of Hawaii to properly complete intent of Specification and Plans.

239
240 **(4)** The Contractor shall make detailed arrangements for work by utility
241 companies pertaining to this contract. Payment to utility companies for their
242 work shall be by the State.

197
198
199
200
201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224
225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
240
241
242
243

244 (5) Electric and telecommunication utility cables and equipment shall be
245 by respective utility companies.

246
247 **(B) Existing Utilities.** Existing utilities are shown on the drawings in
248 approximate locations for the convenience of the Contractor. It is not the intention
249 of plans to imply that all existing utilities are drawn and located, and the fact that
250 any utility is not shown on the drawings shall not relieve the Contractor of his
251 responsibility under this Section. It shall be the Contractor's responsibility to
252 ascertain the location of all existing utilities which may be subject to damages by
253 construction under this Contract. The Contractor shall:

254
255 (1) Support and protect all HE, HT, AT&T, and CATV utilities during
256 construction,

257
258 (2) Notify HE, HT, AT&T, and CATV immediately of any damage to its
259 system caused by construction under this Contract, and

260
261 (3) Reconstruct, at his expense, damaged portions of the utility system
262 in accordance with the requirements and specifications of HE, HT, AT&T,
263 and CATV.

264
265 (4) Contractor shall provide 24-hour access to all utility poles in the
266 vicinity of the construction area.

267
268 (5) Where the Contractor determines that bracing of utility poles is
269 required for execution of the work, the Contractor shall develop detailed
270 pole bracing plans and back-up structural calculations for submission to and
271 review by the utility companies. The plans and calculations are to be
272 stamped by a Structural Engineer licensed in the State of Hawaii.
273 Concurrence by the utility companies of the pole bracing plans does not
274 relieve the Contractor of the responsibility for the integrity of the poles. Any
275 damage occurring as a result of pole damage or failure shall be the paid for
276 by the Contractor. Work to develop the pole bracing designs and supporting
277 calculations is considered incidental to the Contract.

278
279 (6) The Contractor shall be responsible for and shall pay for all damages
280 to existing utilities of all types.

281
282 **(C) HE Facilities.** The Contractor shall provide HE with 24-hour access to all
283 existing HE facilities that are to remain, or, for facilities that are to be removed,
284 until they are removed and to all new HE facilities after they are installed. The
285 Contractor shall be responsible for any delays in utility company work due to his
286 failure to provide access to utility company facilities. All existing HE facilities shall
287 remain in place until proposed permanent facilities are completed and energized.
288 Any cost for temporary relocations arising during construction shall be borne by
289 the Contractor.

291 (1) Electrical equipment or conductors, whether electrically energized or
292 not, shall remain in place at all time during construction. Handling and
293 moving of electrical equipment or conductors, when required by the
294 Engineer, shall be done by HE. Work by the Contractor in areas with
295 energized electrical equipment or conductors shall be performed with
296 extreme caution to prevent accidents and to avoid disturbing or damaging
297 this equipment or conductors or any temporary supports or protective
298 guards that are constructed. Unless otherwise permitted by HE, all work by
299 the Contractor in areas with energized equipment of conductors shall be
300 performed in the presence of a HE inspector and/or standby man. The
301 Contractor shall have the sole responsibility for maintaining safe and
302 efficient working conditions and procedures in these areas.

303
304 (2) Any existing or new HE facilities including equipment or conductors
305 damaged by the Contractor during construction shall be replaced by HE at
306 the Contractor's expense.

307
308 (3) The Contractor shall give HE two weeks advance notice for any work
309 to be done by HE on its facilities. Unless otherwise indicated on the
310 drawings or otherwise directed by the Engineer, HE will:

311
312 (a) Remove the concrete envelope from existing underground
313 HE ducts containing electrical cables.

314
315 (b) Construct temporary supports and protective barriers for
316 bare duct and electrical cables immediately after removal of the
317 concrete envelope is completed. Material for such supports and
318 barriers shall be furnished by the Contractor as an incidental cost.

319
320 (c) Remove temporary supports and protective barriers
321 constructed under item (2) above.

322
323 **(D) HT, AT&T and CATV Facilities.** The Contractor shall provide HT, AT&T,
324 and CATV with 24-hour access to all existing HT, AT&T, and CATV facilities that
325 are to remain, or, for facilities that are to be removed, until they are removed and
326 to all new HT, AT&T and CATV facilities after they are installed. The Contractor
327 shall be responsible for any delays in utility company work due to his failure to
328 provide access to utility company facilities. All existing HT, AT&T, and CATV
329 facilities shall remain in place until proposed permanent facilities are completed
330 and energized. Any cost for temporary relocations arising during construction shall
331 be borne by the Contractor.

332
333 (1) Telecommunications equipment or cables, shall remain in place at
334 all time during construction. Handling and moving of telecommunications
335 equipment or cables, when required by the Engineer, shall be done by their
336 respective Owners. Unless otherwise permitted by HT, AT&T and CATV,
337 all work by the Contractor in areas with energized equipment of conductors

338 shall be performed in the presence of their respective inspector and/or
339 standby man. The Contractor shall have the sole responsibility for
340 maintaining safe and efficient working conditions and procedures in these
341 areas.

342
343 **(2)** Any existing or new HT, AT&T and CATV facilities including
344 equipment or cables damaged by the Contractor during construction shall
345 be replaced by their respective Owners (HT, AT&T and CATV) at the
346 Contractor's expense.

347
348 **(3)** The Contractor shall give HT, AT&T and CATV two weeks advance
349 notice for any work to be done by on their respective facilities.

350
351
352 **(E) Excavation and Backfill.** All excavation and backfill for electric, telephone,
353 AT&T, and cable television underground structures and trenches shall conform to
354 the requirements of Section 206 - Excavation and Backfill for Drainage Facilities,
355 modified as follows:

356
357 **(1)** Excavation.

358
359 **(a)** The width of trenches for concrete encased ducts shall be
360 not less than the width of the encasement nor more than that
361 required to properly and safely execute the work.

362
363 **(b)** Ducts encased in concrete jackets which are bedded in
364 disturbed (fill) ground shall be installed in the following manner:
365 Embankments shall be built up and thoroughly compacted to the
366 elevation which is three feet above the top-of-jacket elevation, or to
367 the required elevation shown on the plans, whichever is less than
368 five times the width of the jacket. This work shall conform to the
369 requirements of Section 203 - Excavation and Embankment. The
370 trench to accommodate the jacket shall then be excavated through
371 the constructed embankment.

372
373 **(c)** The Contractor shall not excavate for manholes, handholes
374 and duct lines until he has the locations for these structures staked
375 out and verified to be correct, and approved by the respective utility
376 company inspectors.

377
378 **(d)** Trenches shall be excavated at least 50 feet ahead of duct
379 placement so that any obstruction to the duct line can be avoided
380 through gradual alignment. The profile grade may be adjusted by
381 the Engineer to increase or decrease the excavation depth (up to 3
382 feet) as a result of unforeseen obstruction at no additional cost.

383
384 **(e)** Excavation for each handhole and manhole, plus 50 feet of

385
386
387
388
389
390
391
392
393
394
395
396
397
398
399
400
401
402
403
404
405
406
407
408
409
410
411
412
413
414
415
416
417
418
419
420
421
422
423
424
425
426
427
428
429
430
431

trenching for all ducts connected to those structures shall be completed, and the locations and depths of the handholes and manholes shall be verified and approved by the respective utility company inspectors prior to construction or installation of the structures. All cuts in excess of depths required shall be filled with concrete, beach sand, or Type A backfill. The lateral limit for handholes and manholes shall be the vertical surfaces two feet outside the neat lines of the structures.

(f) The bottom of the trench excavation shall be flat and smooth. All trenches shall be approved by the Engineer and the utility company inspectors before any ducts or conduits are placed or any structures and foundations are constructed.

(g) The trenches shall be widened at handholes and manholes to permit proper entry of the ducts and conduits.

(h) The Contractor shall provide all sheathing and bracing to support the sides of the excavated trench. Provision and removal of these items are incidental to the trenching work.

(2) Backfill.

(a) No backfilling shall be done until the duct and conduit installations and the handhole and manhole placements have been verified to be correct and approved by the respective utility company inspectors.

(b) Material for use as trench backfill for direct buried cable above select backfill shall be non-expansive and shall conform to Subsection 680.03 (D) (2) (c) below. Backfilling and compaction shall be as specified in Section 206 – Excavation and Backfill for Drainage Facilities. Backfill material shall be beach sand, earth or earth and gravel mixture. If earth and gravel, mixture must pass 1/2 inch mesh screen and contain not more than 20 percent of rock particles by volume.

(c) Material for use as select backfill for direct buried cables shall be non-expansive and shall conform to the requirements of Subsection 703.15 Filler.

(d) Backfilling shall be to finished grades indicated on accompanying drawings, and/or matching existing conditions. Backfill material shall be placed in maximum of 8" layers in loose thickness before compacting. Backfill shall be thoroughly compacted with hand or mechanical tampers to 95% of the ASTM D1557 maximum dry density. In no case shall tamping be

432
433
434
435
436
437
438
439
440
441
442
443
444
445
446
447
448
449
450
451
452
453
454
455
456
457
458
459
460
461
462
463
464
465
466
467
468
469
470
471
472
473
474
475
476
477
478

accomplished by using the wheels or tracks of a vehicle.

(3) Fluidized Thermal Backfill. Backfill for ductbank noted on the contract drawings shall meet the following requirements.

(a) Install Fluidize Thermal Backfill where shown on the drawings to encase pipes and ducts, and at other locations.

(b) Notify Engineer and respective utility inspector three working days before placing Fluidize Thermal Backfill. Fluidize Thermal Backfill shall be placed only in the presence of the Engineer or respective utility inspector.

(c) Trench shall be free of all debris and free of standing water before Fluidize Thermal Backfill is poured.

(d) Anchor pipe type casings to the trench bottom to prevent flotation during Fluidize Thermal Backfill installation. Alternatively, a first thin layer of Fluidize Thermal Backfill shall be poured around the pipe so that when it has hardened it will adequately hold the pipe down without floating, then a second layer of Fluidize Thermal Backfill shall be poured to the prescribed thickness.

(e) Fluidize Thermal Backfill shall be supplied and transported in such a way as to minimize segregation and facilitate installation. Fluidize Thermal Backfill shall be poured or pumped into the trench and shall completely fill all voids without causing segregation. Flow requirements may have to be adjusted for installations using pumps.

(f) If trenches are shored or bulkheads are used on sloping ground, the shoring shall be lifted no later than one hour after the Fluidize Thermal Backfill is poured while the Fluidize Thermal Backfill is still in a semi-fluid state. The Fluidize Thermal Backfill should not be allowed to develop cracks. If cracks or voids are found to exist, they shall be filled by pouring additional Fluidize Thermal Backfill.

(g) In poorly draining native soils, provisions shall be made to allow excess bleed water to drain away or be pumped away.

(h) Where Fluidize Thermal Backfill is used for direct buried conduit applications, place an electrical warning tape 12 inches above the top of the direct buried conduits.

(i) Field Testing: Conduct testing and submit reports for the following. Costs of all testing shall be borne by the Contractor.

479
480
481
482
483
484
485
486
487
488
489
490
491
492
493
494
495
496
497
498
499
500
501
502
503
504
505
506
507
508
509
510
511
512
513
514
515
516
517
518
519
520
521
522
523
524
525

1. Consistency (Flow Test): Shall conform to ASTM C 143-03; one test when a set of strength test cylinders is prepared.
2. Thermal Resistivity (Thermal Probe Test): Conduct thermal resistivity test using Geotherm TPA-7000 equipment in accordance with IEEE Standard 442-1981 and ICC guidelines for the transient thermal probe test. Two cylinders for thermal testing shall be prepared each time strength cylinders are taken. Tests shall be conducted on a sample cured for 4 days and on a sample totally dried in an oven at 105 degrees C.
3. Air Content: Conduct air content test per ASTM C 231-03 when compressive strength test cylinders are prepared.
4. Density Tests: Conduct density tests when thermal resistivity tests are performed.
5. Unconfined compressive strength: A set of 3 cylinders shall be prepared per ASTM C 31-03 for each day's pour plus additional sets for each 100 cubic yards or fraction thereof. Conduct compressive strength tests on each set: 1 at 7 days and 2 at 28 days per ASTM C 39-03.

(F) Installation of Conduits and Duct Banks. All joints shall be water tight and all ducts shall be installed to drain towards pull points unless otherwise shown on the plans.

(1) Plastic Duct Joints.

- (a)** Field cutting of plastic ducts shall be performed by the Contractor and only with the use of a miter box. Burrs shall be removed by filing before the joint is made. All foreign matter shall be wiped off the sockets of the fittings and the edges of the duct with a clean cloth.
- (b)** Cement for plastic duct joints shall be obtained from the duct manufacturer. Thinning of the cement will not be permitted. A liberal and uniform coat of cement shall be applied with a natural bristle brush to the inside of the coupling and to the outside of the duct end. Immediately thereafter, the duct shall be slipped into the socket of the fitting with a half-twist, and the excess cement shall be wiped off.
- (c)** Allow the joined members to cure for at least five minutes before disturbing or applying stress to the joint. After this initial cure,

526
527
528
529
530
531
532
533
534
535
536
537
538
539
540
541
542
543
544
545
546
547
548
549
550
551
552
553
554
555
556
557
558
559
560
561
562
563
564
565
566
567
568
569
570
571
572

care must be exercised in handling to prevent twisting or pulling the joint. In damp weather, this interval shall be increased to allow for slower evaporation of the solvent.

(d) Another fitting or section of conduit may be added to the opposite end within 2 or 3 minutes if care is exercised in handling so that strain is not placed on the previous assembly.

(e) Any joint included in a section of conduit to be bent in the trench shall be assembled above ground and allowed to lie undisturbed for at least two hours before installation. In cases where a plastic connection is made with the union under stress due to misalignment or other factors, the union shall be staked out to relieve stress on the joint until the conduit is backfilled or encased.

(2) Plastic Duct Installation.

(a) The Contractor shall provide spacers to maintain proper separation between ducts. The bottom duct spacers shall be placed on the prepared trench bottom, the first tier of ducts placed in the grooves of the spacers, and couplings attached to the duct ends. Spacers shall be 15 inches or more away from any coupling or joint. Successive lengths of ducts shall then be placed and connected to the preceding lengths as specified above. The second tier of duct spacers shall then be placed over the ducts previously placed and followed by installation of couplings. The operation shall be repeated for each successive tier until the top tier is set in place after which the top spacers are placed.

(b) When conduit is assembled above the ground, the spacer shall be supported in a vertical position by use of a No. 4 rebar and smooth black steel wire, No. 14 gage.

(c) Duct alignment shall be as straight as feasible. Such directional changes as are required shall be made by using field made bends or with segments using angle couplings or deflection couplings, except where otherwise indicated. The deflection angle between two adjacent lengths of duct shall not exceed five degrees, unless otherwise indicated.

(d) Horizontal and vertical bends for HE conduits/ducts shall be constructed with 30-foot minimum radius curves unless otherwise approved by the utility inspector. Horizontal bends for HT, and CATV conduits/ducts shall be constructed with 25-foot minimum radius curves unless indicated otherwise or approved by the respective utility company inspector. Vertical bends for HT, and CATV conduits/ducts shall be constructed with 25-foot minimum

573 radius curves unless indicated otherwise or approved by the
574 respective utility company inspector.

575
576 **(e)** Spacers shall not be located at the centers of a long radius
577 bend. On pre-fabricated bends, the spacer shall be located in the
578 tangent, free of the coupling. On trench formed bend, the spacer
579 shall be located midway between the tangent and center of the
580 bend.

581
582 **(f)** Precaution shall be taken to prevent damage in plastic duct
583 lines from thermal expansion and contraction. All ducts shall be cool
584 when placed in trenches and when the concrete jacket is being
585 poured.

586
587 **(g)** Ducts ending in manholes shall be terminated with junior end
588 bells. End bells, terminators or ducts shall be flush to inside wall
589 surfaces; duct extension into boxes is not acceptable.

590
591 **(h)** The terminated ends of the conduit in an underground
592 structure shall be free of support for a distance of at least 10 feet
593 from the structure. The conduit shall be aligned and supported
594 inside the structure with proper spacing and shall be cut to length
595 after the concrete envelope has cured.

596
597 **(i)** The ends of the conduit shall be sealed with a plastic cap,
598 plug, or approved substitute at the end of each day's work, when
599 work on duct installation has to be interrupted, where ducts may be
600 submerged in water, and in stub outs.

601
602 **(j)** For installation of ducts and innerducts for AT&T, see AT&T
603 Corp. Construction Notes in the contract drawings.

604
605 **(3)** A 4" wide warning tape, orange in color with a black imprinted
606 message "WARNING -- STOP DIGGING -- CALL HAWAIIAN TELCOM,
607 COMMUNICATIONS CABLE BURIED BELOW, FAILURE TO COMPLY
608 COULD RESULT IN LEGAL ACTION", shall be placed 12" below the
609 surface over the duct or concrete jacket for the entire length of duct
610 installations. See HT Standard Drawing No. 34028. Recommended tape
611 is manufactured by Thor Enterprises, Inc., Sun Prairie, WI 53590, part
612 numbers DTOGTE-41 (1,000 feet), and DTOGTE-46 (6,000 feet).
613 Equivalent tapes are acceptable.

614
615 **(4)** The Contractor shall apply a thin coat of sealing compound on ducts
616 and conduits at couplings and bells.

617
618 **(5)** Conduits stubbed for future connections shall be plugged and
619 marked.

620
621
622
623
624
625
626
627
628
629
630
631
632
633
634
635
636
637
638
639
640
641
642
643
644
645
646
647
648
649
650
651
652
653
654
655
656
657
658
659
660
661
662
663
664
665
666

(6) The Contractor shall securely anchor duct banks prior to pouring concrete encasement to prevent ducts from floating.

(G) Installation of Split Ducts Encased in Concrete Jacket. Split ducts with concrete jacket shall be installed around existing cables to remain in service, where shown on the plans.

(1) Field cutting of plastic ducts longitudinally into two equal halves shall be performed by the Contractor with the use of accepted tools and equipment.

(2) The two equal halves of plastic ducts shall be placed carefully around existing cables and sturdily bound together with wire or tape in order not to dislodge during pouring of concrete. The Contractor shall take necessary precautions not to damage the cables and shall work in an expeditious manner in order to keep uncovered cable exposed for as short a period of time as possible.

(3) Subsequent to binding of the plastic ducts, concrete shall be poured to fully encase the ducts. The dimensions of the concrete encasement shall be similar to standard duct formation encasement dimensions.

(H) The Contractor shall test the completed ducts by passing a test mandrel through the length of each duct of each duct run. For HE, and CATV conduits, the mandrel shall be a bullet shaped, blunt tipped type, unless indicated otherwise, about 14 inches long with a diameter 1/2 inch less than the inside diameter of the ducts through the length of each duct run. Mandrel for HT ducts shall be bullet shaped, blunt tipped type about 12 inches long with a diameter 1/4 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 shall be considered an indication of the presence of burrs and/or obstructions in the duct run. The Contractor shall remove such burrs and/or obstructions, after which the test mandrel will be passed through again. All tests shall be conducted in the presence of the Engineer and respective utility company inspectors, and shall be repeated until the results obtained are satisfactory to the Engineer and to the utility company inspectors.

(I) Unless indicated otherwise, the Contractor shall furnish and install a 1/8 inch Polyolefin pull line between pull points in all ducts after testing.

(1) For HT ducts, provide duct measuring/cable pulling tape (NEPTCO WP1800P Muletape or approved equal) in each new duct. Using the duct measuring/cable pulling tape, Contractor shall measure the actual lengths for duct runs and for at least one duct of each common duct run. The distances shall be marked on the record prints and submitted to the Owner at the final inspection. A copy of the record prints shall also be submitted

667 to the HT inspector for record keeping.

668

669 **(2)** For HE ducts, provide duct measuring/cable pulling tape (NEPTCO
670 WP1800P Muletape or approved equal) in each new duct.

671

672 **(J) Concrete.** The Contractor shall notify the utility companies inspector a
673 minimum of 72 hours prior to placement of any concrete.

674

675 **(1)** Securely anchor duct banks prior to pouring concrete encasement to
676 prevent ducts from floating.

677

678 **(2)** When pouring concrete, prevent heavy masses of concrete from
679 falling directly on ducts. If unavoidable, protect ducts with plank.

680

681 **(3)** Direct flow of concrete down sides of duct bank to bottom, allowing
682 concrete to rise between ducts, filling all open spaces uniformly.

683

684 **(4)** To insure against voids in concrete, work a long, flat splicing bar or
685 spatula liberally and carefully up and down the vertical rows of ducts.
686 Mechanical vibrators shall be used for stacked duct banks of three ducts or
687 higher.

688

689 **(5)** Cure concrete for a minimum of 72 hours before permitting traffic
690 and/or backfilling.

691

692 **(6)** Convey concrete from mixer to forms rapidly to prevent segregation.
693 Free drop shall be limited to five feet, unless authorized by inspector.

694

695 **(7)** Placing.

696

697 **(a)** Clean and remove all debris from inside forms and trenches
698 before placing concrete.

699

700 **(b)** Place concrete only on clean damp surfaces, free from water.

701

702 **(c)** Place concrete in forms, in horizontal layers not exceeding
703 18" thickness.

704

705 **(d)** Place concrete to avoid segregation of materials and
706 displacement of ducts, inserts and reinforcing.

707

708 **(e)** Vibrate structural concrete thoroughly during and
709 immediately after placing to insure dense watertight concrete.

710

711 **(8)** Forming.

712

713 **(a)** Forms shall be of good sound lumber with sufficient strength

714 and conforming to shapes and dimensions indicated on drawings.

715
716 **(b)** Forms shall be treated with non-staining form oil immediately
717 before each use.

718
719 **(9)** Patching: Patch all voids, pour joints and holes before concrete is
720 thoroughly dry. Use mortar of same proportions as original concrete.

721
722 **(10)** Curing: Curing of concrete shall be accomplished by impervious
723 membrane method with liquid membrane compound. Apply two or more
724 coats to obtain a total of one gallon for each 150 square feet of concrete
725 surface.

726
727 **(K) Reinforcing Steel.**

728
729 **(1)** Clean reinforcing of mill or rust scale and form to dimensions
730 indicated.

731
732 **(2)** Install reinforcing in proper locations and secure in place to prevent
733 movement during concrete placing or vibrating.

734
735 **(L) Concrete Brick.**

736
737 **(1)** Concrete brick shall be laid in full bed of mortar, both horizontally and
738 vertically.

739
740 **(2)** Mortar shall be one-part cement and three parts sand, thoroughly
741 mixed and used when fresh. Re-tampering will not be allowed.

742
743 **(3)** Setting bed shall be of depth required to bring top of blocks flush with
744 finish line.

745
746 **(M) Restoration of Existing Streets and Other Improvements.** Street,
747 sidewalks, curbs, gutters, traffic detection loops, and other improvements of the
748 State, private owners, or those of the City and County which are maintained by the
749 State, which are damaged by rearrangements to the electric, cable television,
750 AT&T, or telephone system, shall be restored by the Contractor to their original
751 condition. Materials and workmanship shall conform to the applicable sections in
752 these specifications. Payment for all materials and labor required shall be
753 considered as incidental to the various contract items.

754
755 **(1)** Repairing of City streets and other improvements not maintained by
756 the State and where such work is called for on the plans shall conform to
757 the requirements of the City and County of Honolulu.

758
759 **(2)** All disturbed unpaved surfaces shall be backfilled and graded to
760 match the surrounding areas, and sodded areas shall be replanted with the

761 same type of grass. Fences and other improvements shall be restored to
 762 their original condition. This work shall be incidental to and included in the
 763 appropriate contract item under which the rearranged facility is provided.
 764

765 **680.04 Measurement.**

766
 767 **(A)** The electric and communication ductlines, intercept handhole, intercept
 768 manhole and demolition of utility ductlines and structures will be paid on a lump
 769 sum basis. Measurement for payment will not apply.
 770

771 **(B)** The Engineer will measure the handhole penetration, manhole penetration,
 772 transformer pad, pullbox, handhole and manhole per each in accordance with the
 773 contract documents.
 774

775 **680.05 Payment.** The Engineer will pay for the accepted pay items listed below on
 776 a contract lump sum basis, as shown in proposal schedule. Payment will be full
 777 compensation for work prescribed in this section and in contract documents.
 778

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

781 Pay Item	782 Pay Unit
783 HECo Ductline, _____	784 Lump Sum
785 HTCo Ductline, _____	786 Lump Sum
787 CATV Ductline, _____	788 Lump Sum
789 Demolish _____	790 Lump Sum
791 _____ Handhole/Manhole Penetration	792 Each
793 _____ Handhole/Manhole Adjustment	794 Each
795 _____ Handhole	796 Each
797 _____ Manhole	798 Each
799 _____ Intercept Handhole	800 Lump Sum
801 _____ Intercept Manhole	802 Lump Sum
803 HECO Transformer Pad Penetration ____	804 Each
805 AT&T One 6-Inch Conduit Encased in Concrete Jacket 806 with Four 1.5-Inch Inner Ducts	807 Lump Sum

808
809 HECO _-Phase Transformer Pad ____ Each
810
811 Demolish & Remove Transite Ductline After Cables are Removed by ____; Lump Sum
812 Demolition and Removal of Asbestos-Containing Transite Ductline
813 Shall Meet Federal, State, and County Requirements For Hazardous
814 Material Demolition and Removal Work

815
816 The Engineer will pay for the accepted hauling and stockpiling of salvaged
817 materials and equipment off the right-of-way, in accordance with Subsection 104.02 –
818 Changes.”

819
820 The Engineer will not pay for trench and structure excavation and backfill; saw
821 cutting and repairing of existing pavement, sidewalk, curb or gutter; conduit stub-outs;
822 conduit stub-out markers; conduit risers; steel reinforcement for ductlines; conduit
823 interception; manhole/handhole interception of existing ductlines; ductline tie-in, and duct
824 sealing of conduits separately. The Engineer will consider the cost as included in the
825 contract prices of the various contract items. The cost is for the work described in this
826 section and in the contract documents.

827
828
829

END OF SECTION 680

1 Make this Section a part of the Standard Specifications:
2

3 **SECTION 695 - JUST IN TIME TRAINING**
4

5 **695.01 Description.** This Section describes Just-In-Time Training (JITT) and to
6 what items of work or procedures it will apply to.
7

8 **695.02 Materials.** Not applicable
9

10 **695.03 Construction. Just-In-Time Training (JITT).** JITT shall be mandatory, and
11 consist of a Pre-Operational Conference and a formal joint training class on the work
12 the Engineer considers “new technology”, areas that workmanship needs
13 improvement or an areas of work where the work needs to be discussed openly
14 between the Contractor and the State or an area of work that the Engineer may feel
15 should be included. The Engineer may include other areas of work after the bid but
16 the Contractor will only be required to have the JITT for the added training as soon
17 as possible and is not required to have it before the work involved starts although
18 the Contractor is encouraged to. However, the JITT shall be no later if the Engineer
19 allows it. Construction operations for the work listed at bid time shall not begin until
20 the Contractor’s and the Engineer’s personnel have completed the mandatory JITT.
21 The Contractor’s list of participants for the Pre-Operational Conference along with
22 the Engineer’s representatives shall attend the JITT.
23

24 The JITT session will be conducted for not less than 4 hours, unless allowed
25 by the Engineer, on the listed work. Training class if deem as necessary by the
26 Engineer may be an extension of the Pre-Operational Conference. Both of these
27 events shall be conducted at a location convenient for both the Contractor’s and
28 Engineer’s project staffs. Scheduling and completion of the JITT session shall be
29 completed at least 10 working days prior to the start of construction of the activity.
30 The Classes in general will be held during normal working hours. However, the
31 Engineer at its option may choose to schedule the classes outside normal working
32 hours.
33

34 The JITT instructor shall be experienced in the construction methods,
35 materials, and test methods associated with the listed work. The instructor shall not
36 be an employee of the Contractor unless the Engineer allows it. A copy of the
37 syllabus, handouts, and presentations materials shall be submitted to the Engineer
38 at least 14 days before the day of the training. Selection of the course instructor, the
39 course content and training site shall be by the Engineer.
40

41 The Contractor’s or Engineer’s personnel involved with the type of work to be
42 covered if they have completed similar training within the previous 12 months of the
43 date of the JITT will not be required to attend. The determination for exclusion of
44 any staff member’s participation will be determined by the Engineer.
45

46 The Contractor shall make every effort possible to have the workers,
47 subcontractors and suppliers attended the JITT for the work they will be performing.

48
49 It is expressly understood that Just-In-Time Training shall not relieve the
50 Contractor of any responsibility under the contract for the successful completion of
51 the work in conformity with the requirements of the plans and specifications.

52
53 **695.04 Measurement.** The Engineer will not measure JITT when contracted on a
54 lump sum basis. No personnel shall be included in labor costs. All vehicle or
55 transportation costs, or lodging, per diem costs for the contractor shall not be
56 included.

57
58 **695.05 Payment.** The Engineer will pay for the accepted JITT costs. Payment will
59 be full compensation for the work prescribed in this section and the contract
60 documents.

61
62 The Engineer will pay for the following pay items when included in the proposal
63 schedule:

64	Pay Item	Pay Unit
65		
66		
67	Just-In-Time Training	Lump Sum
68		
69		
70		
71		

END OF SECTION 695

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

2
3 **“SECTION 697 – PROJECT WEB PAGE**

4
5 **697.01 Description.** This section describes the development of the project
6 web page in accordance with the contract documents.

7
8 **697.02 Materials.** Not applicable.

9
10 **697.03 Construction.** The Department’s goal is to minimize inconvenience
11 and provide up to date information to highway users, businesses and neighborhoods
12 that abut, or are serviced by, the highways that comprise the project. It will be the
13 responsibility of the Contractor to provide the following services for the well-being of
14 the affected highway users, residents, and businesses.

15
16 The Contractor shall develop a project web page that contains the information
17 listed below:

	Information	Update Frequency
18		
19		
20		
21	(A) Project Work Scope /Description	Beginning of job
22		
23	(B) Project Site Map with description	Beginning of job
24	of information needed	
25		
26	(C) i. 24 hour 7 day a week	Beginning of job
27	Phone Number for Complaints	
28	as specified by the Engineer	
29		
30	ii. DOT Public Affairs Office at	
31	(808)587-2160 and	
32	DOTPAO@hawaii.gov	
33		
34	iii. Other email address as	
35	specified by the Engineer	
36		
37	(D) Project Schedule/Milestones	Beginning of job and when
38		schedule is adjusted or updated.
39		Schedule changes shall be
40		submitted to the Engineer for
41		review and acceptance prior to
42		posting
43		
44	(E) Work Progress Narrative	Every 14 calendar days
45	with Sketches	
46		

47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78

Work progress narrative with sketches may be provided in PDF format. Graphics images posted on the project web page shall not exceed 100k bytes per image and 300k bytes per page to facilitate public viewing. Enlarged images such as maps and information provided in PDF format may be linked to the project web page. Information on linked pages has no size limits. Web technologies that require an extended waiting period for loading like Flash shall not be used.

The Engineer may link this project web page to the Department website at www.hawaii.gov/dot/highways/roadwork.

The web page shall be established within 14 calendar days prior to any lane closures, road closures, or traffic detours. The web page shall be maintained by the contractor until all lane closures, road closures, or traffic detours are completed.

697.04 Measurement. The Engineer will not measure project web page for payment.

697.05 Payment. The Engineer will not pay for project web page separately and will consider the cost for project web page as indicated in the contract prices for various contract pay items. The cost is for the work prescribed in this section and the contract documents.”

END OF SECTION 697

SECTION 699 – MOBILIZATION

Make the following amendments to said Section:

(I) Amend **699.03 Applicability** by revising from lines 21 to 24 to read as follows:

“699.03 Applicability. Maximum bid allowed for this item is an amount not to exceed 6 percent of the sum of all items excluding the bid price of this item.”

(II) Amend **699.05 Payment** by revising from lines 44 to 47 to read as follows:

“Mobilization (Not to exceed 6 percent of the sum of all items
excluding the bid price of this item) Lump Sum”

END OF SECTION 699

1 **SECTION 702 – BITUMINOUS MATERIALS**

2
3 Make the following amendments to said Section:

4
5 **(I)** Amend **Subsection 702.01** by replacing lines 4 to 5 to read:

6
7 **“702.01 Asphalt Cement.**

8
9 **(A) PG 64-16.** Performance graded (PG) asphalt binder (neat or
10 unmodified) shall conform to AASHTO M 320.

11
12 **(B) PG 64E-22.** Performance graded binder (polymer modified) shall
13 conform to AASHTO M 332 and meet the following additional requirement:

14
15 AASHTO T 315 Determining the Rheological Properties of Asphalt
16 Binder Using a Dynamic Shear Rheometer (DSR). Phase angle on original
17 binder shall be less than 77 degrees.

18
19 **(C) Submittals.** Submit, before usage, a Certificate of Compliance,
20 accompanied by substantiating test data, showing conformance with
21 Performance Graded Asphalt Binder Specification. The Engineer will not
22 accept the PG binder without adequate documentation.”

23
24 **(II)** Amend **Subsection 702.06 (Unassigned)** by replacing line 23 to read:

25
26 **“702.06 Warm Mix Asphalt (WMA) Additive.** Additives for WMA shall be
27 approved by the Engineer.”

28
29
30
31
32
33
34 **END OF SECTION 702**

1 **SECTION 706 - CONCRETE, CLAY AND PLASTIC PIPE**
2

3 Make the following amendments to said Section:
4

5 **(I)** Amend **Subsection 706.02(A) RCP for Drainage System** from lines 8 to 28
6 to read as follows:
7

8 **“(A) RCP for Drainage System.** RCP shall conform to AASHTO Load and
9 Resistance Factor Design (LRFD) specifications, and AASHTO M 170 for
10 specified diameters and strength class, and requirements below:
11

12 **(1)** Acceptance shall be based on:
13

14 **(a)** Plant Certification from the American Concrete Pipe
15 Association (ACPA), National Precast Concrete Association
16 (NPCA), or Precast/Prestressed Concrete Institute (PCI).
17

18 **(b)** Certified Plant Load Bearing Test results.
19

20 **(c)** Certified Material Test results.
21

22 **(d)** Inspection for visual defects and imperfections of the
23 manufactured pipe.
24

25 **(2)** Using three-edge-bearing test method, pipe shall be loaded
26 until 0.01-inch crack occurs. Pipe manufacturer shall furnish facilities
27 and provide personnel to perform test according to AASHTO T 280
28 (ASTM C 497). Each section of pipe, in addition to required pipe
29 markings, shall include project identification and inspection lot
30 designation.
31

32 **(3)** Precast reinforced concrete pipe end sections shall conform to
33 the requirements above.”
34

35
36 **END OF SECTION 706**
37

1 **SECTION 709 - REINFORCING STEEL, WIRE ROPE**
2 **AND PRESTRESSING STEEL**

3
4 Make the following amendment to said Section:

5
6 **(I) Amend 709.01(A) Bar Reinforcement** by adding the following after the
7 last paragraph:

8
9 **“(4)** When specified, reinforcing bars shall conform to ASTM A1035 Type CS
10 Grade 100.

11
12 The Contractor shall furnish the materials specified for testing at no cost to
13 the State. The Contractor shall be responsible for delivering the materials in time
14 for testing ahead of anticipated use.”

15
16
17
18 **END OF SECTION 709**

1 **SECTION 712 - MISCELLANEOUS**

2
3 Make the following amendment to said Section:

4
5 **(I) Amend 712.07(A) Frame and Cover** from line 98 to line 112 to read as
6 follows:

7
8 **“(A) Frame and Cover.** Frame and cover for manhole or
9 handhole shall meet requirements of AASHTO M 306.”

10
11 **(II) Amend 712.07(B) Frame and Grate** from line 114 to line 132 to read as
12 follows:

13
14 **(B) Frame and Grate.** Cast iron frame and grate shall conform to
15 AASHTO M 306, unless steel is specified in the contract documents.

16
17 Steel frame and grate shall conform to ASTM A 283/A 283 M, Grade
18 D; ASTM A 27/A 27M, Grade 65-35; or ASTM A 47/A 47 M, Grade 35018.
19 Zinc coating shall be provided in accordance with ASTM A 123/A 123M.

20
21 Reinforcing steel for grate shall conform to Subsection 709.01 -
22 Reinforcing Steel. Frame and grate shall be cleaned thoroughly and
23 painted on all sides that will not be imbedded in concrete with one coat of
24 high-grade asphalt conforming to ASTM A 849, Class M, Fully Coated, at
25 shop. Second coat of paint shall be applied on all sides not imbedded in
26 concrete just before the pre-final inspection. Any damage to the zinc-
27 coating of a frame or grate shall be repaired in accordance with ASTM A780
28 using a Zinc-based solder coating.

29
30 Fabricated frame and grate shall be true to line and free of twists,
31 bends, and open joints. Splices will not be allowed. Cut surfaces and
32 edges shall be made smooth by machining or grinding before fabrication of
33 frame and grate.

34
35 Size and length of weld shall be as specified in contract documents.
36 Welds shall be free of defects, discontinuities and shall have full
37 penetration.”

38
39
40
41
42 **END OF SUBSECTION 712**

1 Make the following Section a part of the Standard Specifications:
2

3 **"SECTION 720 – MACRO-SYNTHETIC FIBERS FOR CONCRETE SIDEWALK**
4 **REINFORCEMENT**

5
6 **720.01 Macro-Synthetic Fibers for Concrete Reinforcement.** Macro-Synthetic
7 Fibers for Concrete Sidewalk Reinforcement shall conform to the following
8 requirements:
9

10 **(A)** Macro-synthetic fibers shall be manufactured from virgin polyolefins
11 (polypropylene and polyethylene) and comply with ASTM C 1116.4.1.3.
12 Fibers manufactured from materials other than polyolefins must show
13 documentary evidence confirming their long term resistance to deterioration
14 when in contact with moisture and alkalies present in cement paste and/or
15 the substances present in air-entraining and chemical admixtures.
16

17 **(B)** The minimum fiber length shall be 1.50 inches.
18

19 **(C)** Macro-synthetic fibers shall have an aspect ratio (length divided by the
20 equivalent diameter of the fiber) between 45 and 150.
21

22 **(D)** Macro-synthetic fibers shall have a minimum tensile strength of 40 ksi
23 when tested in accordance with ASTM D 3822.
24

25 **(E)** Minimum dosage rate in pounds of fibers per cubic yard of concrete
26 shall be established by determining a minimum average residual strength of
27 no less than 150 psi when tested in accordance with ASTM C 1399. The
28 minimum fiber dosage rate shall be 3 lbs/cubic yard.
29

30 **(F)** Macro-synthetic fibers shall have a minimum modulus of elasticity of 400
31 ksi when tested in accordance with ASTM D 3822.”
32
33

34 **END OF SECTION 720**
35
36
37
38
39
40
41
42
43
44

1 **SECTION 750 – TRAFFIC CONTROL SIGN AND MARKER MATERIALS**

2
3 Make the following amendments to said Section:

4
5 **(I)** Amend **Subsection 750.01(A)(1) Retroreflectorization** by replacing lines
6 8 through 31 to read:

7
8 **“(1) Retroreflectorization.** The following shall be retroreflectorized:

9
10 **(a)** Background for illuminated guide signs and exit number panels (“E”
11 designation) with ASTM D 4956 Type XI retroreflective sheeting.

12
13 **(b)** Background for non-illuminated guide signs and exit number panels
14 (“D” designation) with ASTM D 4956 Type XI retroreflective sheeting.

15
16 **(c)** Messages, arrows, and borders of guide signs and exit number
17 panels (“D” and “E” designations) with ASTM D 4956 Type XI
18 retroreflective sheeting.

19
20 **(d)** Regulatory and warning signs, directional signs (“DIR” designation),
21 route and auxiliary markers, shield symbols, yellow “EXIT ONLY” panels,
22 construction warning signs, and barricade rails, completely, with Type III,
23 IV, or IX retroreflective sheeting.

24
25 **(e)** Pedestrian, school, bicycle crossing series, completely with Type IX
26 fluorescent yellow green retroreflective sheeting.”

27
28
29 **(II)** Amend **Subsection 750.01(B) Backing** by replacing lines 72 through 73
30 to read:

31
32 “Aluminum sheet shall conform to ASTM B 209, alloy 5052-H38 or 6061-
33 T6 flat sheet.”

34
35 **(III)** Amend **Subsection 750.01(E) Retroreflective Sheeting Materials** by
36 replacing lines 1126 through 1137 to read:

37
38 **“(E) Retroreflective Sheeting Materials.** Retroreflective sheeting
39 includes white or colored sheeting having smooth outer surface.

40
41 Retroreflective sheeting shall be classified in accordance with ASTM D
42 4956.

43
44 The coefficient of retroreflection shall meet the minimum requirements of
45 ASTM D 4956 for the type of reflective sheeting specified.

47 The color shall conform to the latest appropriate standard color tolerance
48 chart issued by the U.S. Department of Transportation, Federal Highway
49 Administration and to the daytime and nighttime color requirements of ASTM D
50 4956.

51
52 Test methods and procedures shall be in accordance with ASTM.

53
54 **(IV)** Amend **Subsection 750.02 Sign Posts** by replacing lines 1168 through
55 1172 to read:

56
57 **“(C) Square Tube Posts.** Square and other tube posts shall conform to ASTM
58 A 653 for cold-rolled, carbon steel sheet, commercial quality; or ASTM A 787 for
59 electric-resistance-welded, metallic-coated carbon steel mechanical tubing.”

60
61
62
63

END OF SECTION 750

1 **SECTION 755 – PAVEMENT MARKING MATERIALS**

2
3 Make the following amendments to said Section:

4
5 **(I)** Amend **Subsection 755.02 (C) Retroreflective Pavement Markers** by
6 revising lines 223 to 236 to read:

7
8 “Exterior surface of shell shall be smooth and contain one or two
9 retroreflective faces of specified color.”

10
11 **(II)** Amend **Subsection 755.05 (C)(1) Glass Beads** by adding the following
12 after line 869:

13
14 **(f)** The glass spheres shall not contain more than 200 ppm (total)
15 arsenic, 200 ppm (total) antimony nor more than 200 ppm (total)
16 lead, when tested according to EPA Methods 3052 and 6010C.
17 Other suitable x-ray fluorescence spectrometry analysis methods
18 may be used to screen samples of glass spheres for arsenic and
19 lead content.”

20
21
22
23
24
25
26
27 **END OF SECTION 755**

1 **SECTION 760 – ROADWAY AND SIGN LIGHTING SYSTEMS MATERIALS**
2

3 Make the following amendments to said Section:
4

5 Amend **Subsection 760.03 (A)** from line 53 to 130 to read as follows:
6

7 **(A) Luminaires for Roadway Lighting.** Luminaires for roadway lighting shall
8 be LED type as indicated herein and on the contract drawings.
9

10 (1) Housing

11 (a) Die cast aluminum housing.
12

13 (b) A modern design preserving the aesthetic look of traditional
14 roadway Cobrahead fixtures and shall incorporate the heat
15 sink directly into the unit ensuring maximum heat transfer
16 and long LED life.
17

18 (c) Shall meet 3G vibration per ANSI C136.31-2010.
19

20 (d) Power door assembly with removable retention latch.
21

22 (2) LED & Optical Assembly

23 (a) Structured LED array shall be provided for optimized
24 roadway photometric distribution.
25

26 (b) Evolve light engine consisting of scalable reflective
27 technology designed to optimize application efficiency and
28 minimize glare.
29

30 (c) Shall utilize high brightness LEDs, 70 CRI at 4000K.
31

32 (d) LM-79 tests and reports shall be performed in accordance
33 with IESNA standards.
34

35 (3) Ratings

36 (a) UL listed, suitable for wet locations per UL 1598.
37

38 (b) IP66 rated optical enclosure per ANSI C136.25-2009.
39

40 (c) Temperature rated at –40° to 50°C (–40° to 40°C for ERS2
41 347-480V fixtures).
42

43 (d) Upward Light Output Ratio (ULOR) = 0.
44
45
46
47

- 48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
- (4) Lumen Maintenance
 - (a) Lumen Maintenance per TM21.
 - (5) Mounting
 - (a) Slipfitter with +/- 5 degree of adjustment for leveling.
 - (b) Integral die cast mounting pipe stop feature.
 - (c) Wildlife intrusion protection at mounting pipe entry.
 - (d) Adjustable for 1.25 in. or 2 in. mounting pipe.
 - (6) Finish
 - (a) Corrosion resistant polyester powder painted, minimum 2.0 mil. thickness.
 - (b) Standard color: Gray.
 - (7) Electrical
 - (a) 480 volt.
 - (b) System power factor is >90% and THD <26%.
 - (c) Class "A" audible sound rating.
 - (d) Surge Protection: Per ANSI C136.2-2015:
 - (e) Standard 6kV/3kA "Basic: (120 Strikes)".
 - (f) Optional Secondary: 10kV/5kA "Enhanced: (40 Strikes)"
 - (g) EMI: Title 47 CFR Part 15 Class A.
 - (h) LightGrid 2.0 nodes.
 - (i) 5-year limited system warranty standard.
 - (8) Warranty
 - (a) 5-year limited system warranty standard.

END OF SECTION 760

48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75

Installation of a retrofit replacement module into existing pedestrian signal housing shall only require the removal of the existing optical unit components, shall be weather tight and fit securely in the housing; and shall connect directly to existing electrical wiring. The LED module shall have a visual appearance similar to that of an incandescent lamp (ie: Smooth and non-pixelated). Screwed on lenses are not allowed. Only modules with internal mask shall be utilized. No external silk-screen shall be permitted.

When not illuminated, the WALKING PERSON, UPRAISED HAND, and COUNTDOWN DIGITS shall not be readily visible. The countdown digits of the pedestrian signal module shall be located to the right of the associated UPRAISED HAND. The display of the number of remaining seconds shall begin only at the beginning of the pedestrian change interval. After the countdown displays zero, the display shall remain dark until the beginning of the next countdown. The walking person, hand icons and countdown digits shall be incandescent looking.

The units shall not have any external attachments, dip switches, toggle switches or options that will allow the mode to be changed from counting the clearance cycle, to the full walk/don't walk cycle or any other modification to the icons or digits.

For each nominal module, use the corresponding minimum H (height) and W (width) measurements:

Module Size	Icon Height	Icon Width	Countdown Height	Countdown Width	Countdown Segment Width
(16 x 18 in)	11 in	7 in	9 in	7 in	0.7 in

76
77
78
79
80
81
82
83
84
85
86
87
88
89

All exposed components of a module shall be suitable for prolonged exposure to the environment. As a minimum, the module shall be rated for use in the ambient operating temperature range, measured at the exposed rear of the module, of -40°C to +74°C (-40°F to +165°F).

The module shall be a single, self-contained device, not requiring on-site assembly for installation into an existing pedestrian signal housing. The power supply shall be located inside the pedestrian signal module. The assembly and manufacturing process for the module shall be designed to assure all internal LED and electronic components are adequately supported to withstand mechanical shock and vibration from high winds and other sources.

90
91
92
93
94
95
96
97
98
99
100
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134

The front window shall be a transparent polycarbonate material with internal masking to prevent the icons and digits from being visible when not in operation. External masking or silk-screen technology shall not be permitted.

Each module shall be identified on the backside with the manufacturer's name, model, serial number and operating characteristics. The operating characteristics shall include the nominal operating voltage and stabilized power consumption, in watts and/or Volt-Amperes.

(C) Photometric Requirements

For a minimum period of 60 months, the maintained minimum luminance values for the modules under operating conditions, when measured normal to the plane of the icon surface, shall not be less than:

- Walking person: 2,200 cd/m²;
- Hand: 1,400 cd/m².
- Countdown digits: 1,400 cd/m²;

The luminance of the emitting surface, measured at angles from the normal of the surface, may decrease linearly to a value of 50% of the values listed above at an angle of 15 degrees. The LED module shall have a visual appearance similar to that of an incandescent lamp (ie: Smooth and non-pixelated).

Maximum permissible luminance: When operated within the temperature range, the actual luminance for a module shall not exceed three times the required peak value of the minimum maintained luminance. Luminance uniformity: The uniformity of the signal output across the emitting section of the module lens (i.e. the hand, person or countdown icon) shall not exceed a ratio of 5 to 1 between the maximum and minimum luminance values (cd/m²).

The standard colors for the LED Pedestrian Signal Module shall be White for the walking person and Portland Orange for the hand icon and the countdown digits.

(D) Electrical Requirements

All wiring and terminal blocks shall meet the requirements of Section 13.02 of the VTCSH Standard. Maximum of three secured, color coded, 1 meter (39 in) long 600 V, 16 AWG minimum, jacketed wires, conforming to the National Electrical Code, rated for service at +105°C, are to be provided for electrical connection. The

135
136
137
138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179

conductors shall be color coded with orange for the hand, blue for the walking person and white as the common lead.

LED modules shall operate from a 60 ± 3 Hertz ac line power over a voltage range from 80 to 135 VAC RMS. Nominal operating voltage for all measurements shall be 120 ± 3 VAC RMS. Fluctuations in line voltage over the range of 80 to 135 VAC RMS shall not affect luminous intensity by more than ± 10 %. To prevent the appearance of flicker, the module circuitry shall drive the LEDs at frequencies greater than 100 Hz when modulated, or at DC, over the voltage range specified.

Low Voltage Turn Off: There should be no illumination of the module when the applied voltage is less than 35 VAC RMS. To test for this condition, each icon must first be fully illuminated at the nominal operating voltage. The applied voltage shall then be reduced to the point where there is no illumination. This point must be greater than 35 VAC RMS.

Turn-ON and Turn-OFF Time: A module shall reach 90% of full illumination (turn-ON) within 75 msec of the application of the nominal operating voltage. The signal shall cease emitting visible illumination (turn-OFF) within 75 msec of the removal of the nominal operating voltage.

Default Condition: For abnormal conditions when nominal voltage is applied to the unit across the two-phase wires (rather than being applied to the phase wire and the neutral wire) the pedestrian signal unit shall default to the hand symbol. The on-board circuitry of a module shall include voltage surge protection:

- To withstand high-repetition noise transients and low-repetition high-energy transients as specified in NEMA Standard TS-2 2003; Section 2.1.8
- Section 8.2 IEC 1000-4-5 & Section 6.1.2 ANSI/IEEE C62.41.2-2002, 3kV, 2 ohm
- Section 8.0 IEC 1000-4-12 & Section 6.1.1 ANSI/IEEE C62.41.2-2002, 6kV, 30 ohm

The LED signal and associated on-board circuitry shall meet the requirements of the Federal Communications Commission (FCC) Title 47, Subpart B, Section 15 regulations concerning the emission of electronic noise by Class A digital devices. The modules shall provide a power factor of 0.90 or greater when operated at nominal operating voltage, and 25°C (77°F). Total harmonic distortion

180 induced into an AC power line by the module, operated at nominal
181 operating voltage, and at 25°C (77°F) shall not exceed 20%.

182
183 The current draw shall be sufficient to ensure compatibility and
184 proper triggering and operation of load current switches and conflict
185 monitors in signal controller units. Off State Voltage Decay: When
186 the module is switched from the On state to the Off state the terminal
187 voltage shall decay to a value less than 10 VAC RMS in less than
188 100 milliseconds when driven by a maximum allowed load switch
189 leakage current of 10 milliamps peak (7.1 milliamps AC).

190
191 **(E) Module Functions**

192
193 The module shall operate in one mode: *Clearance Cycle*
194 *Countdown Mode Only*. The module shall start counting when the
195 flashing don't walk turns on and will countdown to "0" and turn off
196 when the steady "Don't Walk" signal turns on. The *module shall not*
197 *have user accessible switches or controls for the purpose of*
198 *modifying the cycle, icons or digits*. At power on, the module enters
199 a single automatic learning cycle. During the automatic learning
200 cycle, the countdown display shall remain dark. The unit shall re-
201 program itself if it detects any increase or decrease of Pedestrian
202 Timing. The digits shall go blank once a change is detected and
203 then take one complete pedestrian cycle (with no counter during
204 this cycle) to adjust its buffer timer.

205
206 The module shall allow for consecutive cycles without displaying
207 the steady Hand icon ("Don't Walk"). The module shall recognize
208 preemption events and temporarily modify the crossing cycle
209 accordingly. If the controller preempts during the walking man, the
210 countdown shall follow the controller's directions and shall adjust
211 from walking man to flashing hand. It shall start to count down
212 during the flashing hand. If the controller preempts during the
213 flashing hand, the countdown shall continue to count down without
214 interruption. The next cycle, following the preemption event, shall
215 use the correct, initially programmed values. This specification is
216 worded such that the flashing don't walk time is not modified.

217
218 If the controller output displays Don't Walk steady condition or if
219 both the hand /person go dark and the unit has not arrived to zero,
220 the unit suspends any timing and the digits shall go dark.

221 **(F) Warranty**

222
223 Manufacturers will provide the following warranty provisions.
224 Replacement or repair of an LED signal module that fails to function

225 as intended due to workmanship or material defects within the first
226 5 years (60 months) from the date of delivery.”

227
228 **(IV) Amend Subsection 770.05(A)- Controller Assembly** from line 617 to
229 625 to read:

230
231 **“(1)** Model 170E controller assembly and Model 332A controller cabinet
232 refers to latest Model 170E controller assembly and Model 332A controller
233 cabinet listed on CALTRANS QPL. Model 170E controller will be provided
234 by DTS.

235
236 **(2)** The 170 software shall be the latest version of BI Trans Systems,
237 Inc’s 233 Traffic Signal Program and shall be Contractor furnished. The
238 Contractor shall furnish and install the EPROM chips in the controller.

239
240 **(3)** Each controller assembly listed in Table 770.05-1 – Controller
241 Assembly Requirements contains sufficient equipment for full 8-vehicle, 4-
242 pedestrian, and 4-preemption phase intersection, even though the
243 contract documents may not require it.

244

TABLE 770.05-1 – CONTROLLER ASSEMBLY REQUIREMENTS	
<u>Item</u>	<u>Quantity</u>
Model 170E Controller – Provided by DTS	1
Model 412C Prom Module	1
Model 400 Modem	1
332A Aluminum Cabinet	1
Model 200 Load Switches	12
Model 204 Flasher	All
Model 242 Isolators	2
Model FS/ST Isolator	All
Flash Transfer Relays	All
Software	1
Model 210 Conflict Monitor (Crimp and Poke Type, such as Molex Dualcon TM Straight/on Edge Dual Position Connectors, or approved equal)	1
Model 262C Detector Amplifiers (Rotary Sw Type)	8
Model M762 Preempt. Car (Non-QPL) with M768 Auxiliary Input Panel	2
Model GPS Time Source (Non-QPL)	1

245
246 **(V) Amend Subsection 770.05(B)- Model 170E Controller** by deleting line
247 643.

248
249 **(VI) Amend Subsection 770.05(C)(5)- Cabinet** by deleting lines 660 to 665.

250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
292
293
294
295

(VII) Amend Subsection 770.05(D)- Auxiliary Equipment from line 697 to 741 to read:

(1) Model M762 Optical Preemption Module with M768 Auxiliary Input Panel. M762 shall be card-type and shall interface with Model 170 cabinet preemption slots of input file. Each M762 Module shall have two channels of preemption. M762 shall include firmware to discriminate between two valid priority signals, to prioritize valid same priority signals on a first come, first served basis, and to override low priority signal if high priority is received. M762 Module shall receive input signals (9.639 and 14.035 Hz) to permit priority preemption operation within 170 local intersection program. M762 shall optically isolate output signals and shall trigger active low signal to controller for high priority and pulsed active low signal for low priority. M768 Auxiliary Input Panel shall be used to interconnect M762 with the terminals inside the traffic cabinet. The State’s preemption systems employ the 3M/Global Traffic Technologies Opticom System. New preemption equipment shall be 3M/Global Traffic Technologies Opticom or accepted equal that is fully compatible with 3M/Global Traffic Technologies Opticom.

(2) Security Tumbler for Signal Cabinet. The signal control cabinet door locks (2 locks for each cabinet) are keyed to take Best Lock Series tumblers. The contractor shall furnish and install 2 lock cylinders that will fit in the current locks on the signal cabinet. The lock cylinders keys shall be one of a kind, licensed to DTS, and each cylinder shall have 2 sets of keys with “do not duplicate” stamped on each key.

(VIII) Amend Subsection 770.06(G) – Type 7 Preemption Detector (Opticom) Cables from line 788 to 798 to read:

“(G) Type 7 - Preemption Detector (Opticom) Cables. Preemption detector (Opticom) cables are specific cables that run continuously from optical detectors mounted on traffic signal standards to terminal blocks for M762 phase module located in controller cabinet. Each detector shall be furnished with its own cable running back to controller cabinet. 3M/Global Traffic Technologies’ M138 Optical Detector Cable shall be furnished for detector cable because it is compatible and consistent with requirements for Opticom Preemption System. M138 cable shall be furnished that is BerkTek Type B, shield jacket, three - insulated conductor cable, 20 AWG, one - 20 AWG bare stranded ground, 600 Volts, orange-blue-yellow color coded and 5/16 inch diameter.”

(IX) Amend Subsection 770.11 – Preemption Detectors from line 997 to 1009 to read:

296
297
298
299
300
301
302
303
304
305
306
307
308
309
310
311
312
313
314
315
316
317
318
319
320
321
322
323
324
325
326
327
328
329
330
331
332
333
334
335
336
337
338
339
340
341

“(A) Description. Preemption Detectors shall be located on traffic signal standards to convert optical signals emitted from an emergency vehicle to electrical pulses for emergency preemption of traffic signals. Electrical signals from optical detector shall be transmitted by 4-conductor cable to preemption module M762 located in input slot of controller cabinet. M762 preemption module shall direct and hold controller in preemption mode until signal disappears. Preprogrammed selection of phases and signal displays shall be controlled by Local Intersection Program. The State’s preemption system employ 3M/Global Traffic Technologies Opticom System. New preemption equipment shall be by 3M/Global Traffic Technologies Opticom or equal accepted by the Engineer, that is fully compatible with 3M/Global Traffic Technologies Opticom. Astro-mini brackets or similar device for attaching preemption detector to poles shall be included.”

(X) Amend **Subsection 770.11 – Preemption Detectors** from line 1012 to 1021 to read:

“(1) Type 7 Cable. Type 7 preemption detector (Opticom) cables shall be specific cables that run continuously from optical detectors mounted on traffic signal standards to terminal blocks for M762 phase module in controller cabinet. Type 7 preemption detector cable shall be compatible with 3M/Global Traffic Technologies’ M138 Optical Detector cable and shall be consistent with requirements for Opticom Preemption System. M138 cable shall be BerkTek Type B, shield jacket, 3-insulated conductor, 20AWG stranded copper, 1-20AWG bare stranded ground, 600 volts, orange-blue-yellow color coded, and 5/16-inch diameter.”

(XI) Add **Subsection 770.12 – Pedestrian Signal Push Button With Integral Sign** to read:

“(A) Description. The pedestrian push button unit shall consist of an assembly that can be secured to traffic poles with standard screws, be tamper proof, weatherproof, and constructed so that electrical shocks are impossible to receive.

(B) Materials.

(1) The housing for the push button assembly shall be of cast and/or machined aluminum. The push button assembly shall be weatherproof with a water diverting groove set in the outside diameter of the actuator button receptor. The housing shall be designed to reduce vandalism and shall mount on the side or top of a pole with a minimum 2-inch diameter button. The push button housing shall be capable of mounting in an ‘up button’ or ‘down

342 button' configuration. All wire connections shall be accessible from
343 the back of the assembly.

344
345 (2) An ADA acceptable raised directional sign shall be installed
346 with stainless steel fasteners to the housing. The sign shall consist
347 of a raised walking person and a raised arrow indication. Paint the
348 unit black and paint the raised walking person and arrow white.
349 The sign shall be capable of mounting in an 'up button' or 'down
350 button' configuration. The raised walking person and arrows shall
351 be directional and match the indication as shown in the plans.

352
353 (3) The pushbutton shall extend from the sign faceplate
354 approximately three inches. The pushbutton actuator shall be
355 convex in design having a flat area on the face for uses of a stylus,
356 ADA acceptable, two inches in diameter, and have a tension of less
357 than five pounds when pressed. The button shall be manufactured
358 in a way that it cannot be stuck in a closed (constant call) position.

359
360 (4) The pedestrian push button shall be a piezo electric type and
361 be UL listed. The button shall have a stainless steel actuator and
362 shall be mounted within the housing with stainless steel, non-
363 corrosive, tamper proof fasteners. The unit shall operate between
364 12-24V DC or AC, 3 inch round mounts with 4 mounting bolts. The
365 pedestrian button shall give an audio and visual signal each time
366 the pedestrian button is activated."

367
368 (XII) Add **Subsection 770.13 – Interconnect Fabric Subduct** to read:

369
370 **"770.13 Interconnect Fabric Subduct.**

371
372 (A) **Description** A non-metallic flexible textile raceway known
373 as interconnect fabric subduct, which is placed within PVC
374 conduits. The interconnect fabric subduct allows for the future
375 communication upgrades, including transitioning from multipair
376 copper cables to fiber optic media. To further that effort and
377 achieve maximum conduit utilization, all new and empty existing
378 conduits containing the interconnect/fiber optic cables shall contain
379 an interconnect fabric subduct. The interconnect fabric subduct
380 shall consist of flexible, textile material, sometimes referred to as
381 "fabric duct".

382
383 (B) **Fabric** The interconnect fabric subduct shall consist of the
384 following:

385
386 A. Standard Outdoor Textile subduct: Micro (33mm), 2-inch,
387 3-inch and 4-inch multi-cell polyester/nylon textile subduct
388 containing 1,250 lb polyester flat woven pull tape.

389
390
391
392
393
394
395
396
397
398
399
400
401
402
403
404
405
406
407
408
409
410
411
412
413
414
415
416
417
418
419
420
421
422
423
424
425
426
427
428
429
430
431
432
433
434
435
436
437

Number of cells shall be the maximum number allowed for the conduit size.

B. Conduit Plugs: Compression-type conduit plugs with locking nuts for sealing and securing one or more textile subducts within a conduit.

C. Pull Tape: The subduct pull tape shall be constructed of synthetic fiber, printed with accurate sequential footage marks and color-coded.

D. Duct Water Seal: products suitable for closing underground and entrance conduit openings where subduct is installed, to prevent entry of gases, liquids, or rodents into the structure.

(C) Installation The contractor shall protect the interconnect fabric subduct from the effects of moisture, UV exposure, corrosion and physical damage during installation. The contractor shall install the interconnect fabric subduct prior to installing the new interconnect and fiber optic cables.

The contractor shall provide interconnect fabric subduct in conduits using continuous unspliced lengths of interconnect fabric subduct between pull boxes, and/or termination points as indicated on the drawings.

The contractor shall make a 2" incision, approximately 18" from the end of interconnect fabric subduct. Pull out and cut off approximately 2 feet of pull-tape. Thus allowing the pull tape ends to retract back into the cells.

Using approximately 6 feet of pull tape, tie a non-slip knot to the incision. Then tie 3 to 6 half-hitch knots down to the end of interconnect fabric subduct. Apply black vinyl tape over all knots and the end of interconnect fabric subduct. Using a Bow Line knot tie a swivel to the end of 3 feet pull tape. For multi-pack installations one swivel is sufficient, but stagger each interconnect fabric subduct.

Using a Bow Line knot, attach the pull rope located in the rigid conduit to the other end of the swivel. Install interconnect fabric subduct - ensuring that no twist is introduced to the interconnect fabric subduct.

Provide suitable interconnect fabric subduct slack in the pull boxes, and at turns to ensure there is no kinking or binding of the product.

438
439
440
441
442
443
444
445
446
447
448
449
450
451
452
453
454

At locations where interconnect fabric subduct will be continuous through a pullbox, allow sufficient slack so that the interconnect fabric subduct may be secured to the side of the pullbox maintaining the minimum bending radius.

At pullboxes serving as the junction location, pull the exposed end of the interconnect fabric subduct to the far end of the pullbox, install termination bag, and secure to the pullbox.

Seal all conduit and interconnect fabric subduct entering the pullboxes to prevent entrance into the pullboxes of gases, liquids or rodents.”

END OF SECTION 770