STATE OF HAWAI‘I

DEPARTMENT OF HAWAIIAN HOME LANDS

91-5420 Kapolei Parkway,
Kapolei, HI. 96707

SECTION 5

TECHNICAL SPECIFICATIONS

for

WEST O‘AHU SEWER IMPROVEMENTS – WAI‘ANAE SUBDIVISION

WAI‘ANAE, O‘AHU, HAWAI‘I

T.M.K. (1) 8-5-30:52-54, 88-99, & 111-125

(1) 8-5-31:13-25, 32-34, & 69-72

(1) 8-5-32:37-38

(1) 8-5-033:1-3, 35, 113-117, & 130-134

IFB No.: IFB-22-HHL-001

November 2022

DIVISION 1 – GENERAL REQUIREMENTS

SECTION 01010 – GENERAL WORK

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS AND COVENANTS: The General Conditions, Construction General Specifications, Special Provisions, and other applicable documents preceding these specifications shall govern all work specified hereinafter of all Divisions and Sections.

1.02 APPLICABLE REGULATIONS: The Contractor shall comply with all local laws, ordinances, rules and regulations pertaining to such work, and shall obtain all required permits, licenses, and certificates, and publish and post all notices required thereby.

1.03 DESCRIPTION OF THE WORK: Major components of this project include, but are not limited to the following:

A. Field identification and location of existing primary sanitary sewer cleanouts;
B. Installation of new primary sanitary sewer cleanouts;
C. Replacement of existing sanitary sewers and sewer manholes;
D. Rehabilitation of existing sewer manholes;
E. Exposing and raising of existing buried manholes;
F. Surface restoration associated with the construction work.

The listed work items above will require the Contractor to perform construction within private properties. The Contractor shall obtain the right of entry and coordinate construction activities with the property owners.

Sewer line replacement shall be constructed back into the same trench, and is inclusive of testing and inspections, all lateral reconnection, and bypassing to provide continuous sewer service and restoration to surfaces.

Rehabilitation of sewer manholes is inclusive of bypassing, cleaning, patching, epoxy coating installation, testing/inspection, reconstruction and restoration of sewer manhole frames and covers, and manhole inflow insert installation. These specifications are divided for convenience into titled divisions and sections as set forth in the TABLE OF CONTENTS preceding these specifications and shall not be considered an accurate or complete segregation of the several units of labor and materials. No responsibility, either direct or implied is assumed by the Department of Hawaiian Home Lands (DHHL) for omissions or duplications of the subject matter. The Contractor will be held responsible for the complete work whenever or wherever the parts are described in one or more trade heads. Any mention in these sections or indication on the drawings of articles, materials, equipment, operations, incidentals, supervision, or methods require that the Contractor

furnish each item as indicated by the kind, type, or design, and quality of each item so mentioned or indicated on the drawings.

Where devices or items, or parts thereof are referred to in the singular, it is intended that such references shall apply to as many such devices, items, or parts as are required to properly complete the work.

Schedule of work included in these specification sections are given for convenience and shall not be considered a comprehensive list of items necessary to complete the work of any section. The Contractor shall employ the usual standard practice of coordinating the work covered in each section with the work of other sections. The necessary information and the items, accessories, anchors, connections, patterns, templates, etc., shall be delivered when required in order to prevent any delay in the progress and completion of the work.

1.04 PLANS AND SPECIFICATIONS: These specifications are intended to cover all labor, materials and standards of workmanship indicated on the plans and called for in the specifications, or reasonably implied therein. The plans and specifications complement one another; any part of the work mentioned in one and not represented in the other, shall be done the same as if it had been mentioned or represented in both.

The Contractor shall not alter from the drawings and specifications. In the event of errors or discrepancies, the Contractor shall immediately notify the Project Manager.

All figured dimensions take precedence over scaled measurements. No important dimension shall be determined by scale.

Specifications and drawings are prepared in abbreviated form and may include incomplete sentences. Omissions of words or phrases such as "the Contractor shall", "as shown on the drawing", "a", "an", and "the" are intentional. Omitted words and phrases shall be provided by inference to form complete sentences.

In the Contract Documents, “Project Manager” and “Officer-in-Charge” mean the person, authorized by DHHL and defined in DHHL Construction General Conditions, in charge of the construction management; they are interchangeable.

1.05 STATE WATERS:

A. During construction of this project, DHHL does not intend for any discharges of construction water into State waters, as defined by HAR, Title 11-54 and Title 11-55.

B. The Contractor shall be responsible for the planning, permitting, designing, and implementing measures to avoid any construction activity discharges from entering State waters.

C. The Contractor shall be responsible for submitting, obtaining, and procuring the following NPDES permits with the State Department of Health (DOH) if required.

1. Storm water runoff from construction activities.
2. Hydrotest fluids.
3. Dewatering fluids.

D. The cost and time to obtain approvals for all permits shall be inclusive in the Bid Price and any permit approval delays shall be the responsibility of the Contractor.

1.06 REFERENCE STANDARDS: All work shall be done in accordance with the most current standards listed below as amended and/or amplified herein.

ASTM	American Society for Testing and Materials
UPC	Uniform Plumbing Code

1.07 REFERENCE DESIGN DOCUMENTS: The following documents are references incorporated herein and made a part of the Plans and Specifications, and bid documents:

A. Standard Specifications for Public Works Construction, State of Hawai‘i, September 1986, and all applicable updates

B. Standard Details for Public Works Construction, State of Hawai‘i, Revised September 2000, and all applicable updates

C. Wastewater System Standard Details, City and County of Honolulu, July 2017 and all applicable updatesoahu

D.

E. Field Reports of CCTV and Manhole Inspections, available from DHHL

F. Primary Cleanout Survey Reports, available from DHHL

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01030 – LEGAL NOTICE

PART 1 - GENERAL

The Contractor shall publish a legal notice in the Honolulu Star Advertiser for three (3) consecutive days, one week prior to starting work on this project, to inform the public of the proposed work. The legal notice shall be in accordance with the current State of Hawai‘i, Department of Transportation, Standard Specifications for Road and Bridge Construction, Subsection 645.03(H) – Advertisement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

The legal notice shall be coordinated with the Project Manager and shall contain, but must not be limited to, the following information:

1) Map of the project area, identifying street(s) to be affected, together with a general description of the work to be undertaken.

2) The date work will start and the approximate date of completion.

3) Working hours and days of work.

4) Detour pattern, if any, and description of traffic flow in the detour area.

5) Suggestion that motorists use alternative routes and drive with caution in the construction area.

6) If the project will be constructed in phases, include phases and anticipated start and completion dates.

7) General business office number for the Contractor.

8) Any other information that will be useful to the public.

Quality of map shall conform to the following requirements:

1) No freehand printing or penciling.

2) Highlight important features by darkening, cross-hatching, crossing-out or coloring important words, as necessary.

3) Provide maps with minimum size of five (5) columns wide by four (4) columns deep. Lesser width columns may be considered to balance against size of drawing.

4) Text specifications:

    a. Work being featured – 3/16-inch text.

    b. Major roads and features – 1/8-inch text.

    c. Other roads and features – first letter of sentence in upper case.

    d. "NOTICE TO MOTORISTS" in upper case.

    e. Message – first letter of sentence in upper case.

5) Line thickness

    a. Important feature being advertised – line thicker than rest of the map.

    b. Directional arrow – bolder than rest of the lines shown on the map, when important, to show route traffic that should be used.

The Contractor shall submit a sample of the notice to the Project Manager for approval at least six (6) weeks in advance of publication. The notice shall be the actual size of the notice to be published in the newspaper. The notice shall be professionally prepared to the satisfaction of the Project Manager and shall not be hand printed or drawn.

END OF SECTION

SECTION 01050 – EXAMINATION OF SITE

PART 1 - GENERAL

Offerors shall carefully examine the Project site and shall thoroughly familiarize themselves with the conditions present at the site and the amount and kind of work to be performed, in compliance with Sections 5.8 of the DHHL CONSTRUCTION GENERAL INSTRUCTIONS.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 REVIEW OF REPORTS AND OTHER DATA

The soil engineering report and existing record drawings/maps for underground utilities in the vicinity are included in the bidding documents. Offerors are instructed to review them and contact Ms. Sara Okuda, Project Manager, Land Development Division, via facsimile at (808) 620-9299, or E-mail to: sara.t.okuda@hawaii.gov to arrange video recording viewings of the existing sewer lines, and review of pipeline and manhole inspection reports, as well as sewer cleanout survey reports.

A. Geotechnical Information

Offerors shall review all geotechnical information available for the Project site to familiarize themselves with the subsurface conditions. A subsurface exploration has been performed for the design of this project and the results are provided in the geotechnical report titled, "Geotechnical Investigation, DHHL West O‘ahu Sewer Improvements, Residential Subdivision, Wai‘anae, Hawai‘i, TMK: 8-5-030 through 033", dated April 14, 2021, prepared by Hirata & Associates, Inc.

B. CCTV and MH Inspection Data, and Sewer Cleanout Survey Data

Closed circuit television (CCTV) inspections and manhole inspections of the existing sewer lines as well as survey of sewer cleanouts within the Project area were performed under the planning phase. Contractors are recommended to examine the conditions of the existing sewer manholes to be rehabilitated or replaced and cleanouts where the new sewer laterals are connected to, and the conditions of the existing sewer pipes where the new sewer manholes are installed. The CCTV inspections also identified the existing sewer lateral connection approximate locations.

C. Construction Plans

Offerors shall also review the current construction plans for other construction

projects in the project vicinity that may affect this project.

3.02 SITE VISIT

A site visit is non-mandatory. Offerors are strongly encouraged to attend the Pre-Bid Conference and conduct their site visits due to the challenging space constraints and access to private properties that cannot be conveyed by the Plans alone.

END OF SECTION

SECTION 01060 – DIFFERING SITE CONDITIONS

PART 1 - GENERAL

This section shall supplement Section 4.9, Differing Site Conditions (HAR 3-125-11), of the DHHL CONSTRUCTION GENERAL INSTRUCTIONS.

Price adjustment will be permitted for the Differing Site Condition, provided the following conditions are satisfactorily addressed:

A. Adjustments of price or time for performance. After receipt of the notice, the Project Manager shall promptly investigate the site, and if it is found that the conditions do materially so differ and cause an increase in the Contractor's cost of, or the time required for, performance of any part of the work under this contract, whether or not changed as a result of the conditions, an adjustment shall be made and the contract modified in writing accordingly. Any adjustment in contract price made pursuant to this clause shall be determined in accordance with the price adjustment clause of this contract.

B. Timeliness of claim. No claim of the Contractor under this clause shall be allowed unless the Contractor has given the notice required in this clause; provided, however, that the time prescribed therefore may be extended by the Project Manager in writing.

C. No claim after final payment. No claim by the Contractor for an adjustment thereunder shall be allowed if asserted after final payment under this Contractor.

D. Knowledge. Nothing contained in this clause shall be grounds for an adjustment in compensation if the Contractor had actual knowledge of the existence of such conditions prior to the submission of bids [HAR 3-1- 125-11(1)]

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

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END OF SECTION

SECTION 01070 – SAFETY AND HEALTH

PART 1 – GENERAL

This section shall supplement construction documents pertaining to the safety and health in connection with the performance of the project.

1.01 WORK INSIDE EXISTING MANHOLES: The Contractor shall exercise extreme caution when working inside any sewer manhole.

The following are major health and safety hazards which may be present in the sewer manholes.

- Ammonia gas (NH3) poisoning,
- Oxygen deficiency,
- Hydrogen sulfide gas poisoning,
- Flammable gases and liquids,
- Pathogens, and
- Carbon monoxide poisoning

Working inside a sewer manhole also exposes to raw sewage and vermin that pose health threats to the human body. The Contractor shall assume all responsibility for the health and safety of his personnel who are working at the job site. Failure to comply with the provisions of the safety plan or with the applicable safety and health regulations outlined previously will be grounds for shutdown of work with no additional compensation.

1.02 SAFETY AND HEALTH REGULATIONS: The Contractor shall comply with hand safety requirements as specified in SECTION 01560, "Confined Space Entry".

1.03 SUBMITTAL: The Contractor shall submit a Safety Plan forty-five (45) calendar days prior to working on site. As a minimum, the Plan shall include the following:

- major health and safety hazards
- policies, controls, and work practices used to minimize those hazards
- response procedures and contact information should an accident happen
- safety training and confined space entry certification

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01110 – PUBLIC RELATIONS

PART 1 – GENERAL

The project is located within residential areas and the Contractor's work will be in very close proximity to residences. Good public relations with all property owners, residents, their guests, and any other persons affected by the Project shall be maintained by the Contractor at all times. Special care shall be taken to safeguard all persons and all existing private properties, structures, and improvements. Construction impacts shall be kept strictly within the requirements specified in these Contract Documents and any applicable laws and regulations.

All expenses for Public Relations, including preparation and distribution of the information packet, written flyers for additional notifications, and public informational meetings shall be paid for by the Contractor.

1.01 INFORMATION PACKET PREPARED BY THE CONTRACTOR

The Contractor shall prepare and distribute an information packet to all properties abutting the project sites and other affected properties near the sites thirty (30) calendar days prior to construction. The informational packet shall also include pertinent information such as the anticipated project schedule, proposed construction techniques, anticipated construction impacts, and proposed environmental impact mitigation measures. The Contractor shall provide the Project Manager with a draft informational packet for review and approval within twenty-one (21) calendar days after the notice to proceed.

The Contractor shall be responsible for coordinating the Project work with affected property owners, lessees (if applicable), and community groups (e.g., Condominium Property Managers and Site Managers, and Neighborhood Boards), and for notifying them in writing thirty (30) calendar days prior to commencing any work. The Contractor shall also be responsible for coordinating work with affected government agencies, and for notifying them in writing thirty (30) calendar days prior to commencing any work. Work shall not commence until such timely notices have been given.

The required written notices shall be coordinated with the Project Manager and shall include the following information:

A. Brief description of the project.
B. Construction schedule.
C. Detailed description of the work and the dates that work will be performed on, fronting and in the immediate area of each lot, as applicable. For dead end streets, the immediate area shall include all lots fronting the dead end streets where work will be conducted. For through streets, the immediate area shall include all lots on either side of the street within the block in which work will be conducted.

D. Description of the inconveniences that may be experienced by residents and the measures that will be taken to minimize the inconveniences.
E. Description of restoration that will be performed upon completion of the work.
F. Names and emergency telephone numbers of key Contractor and project inspection personnel (the Contractor personnel shall be available and able to respond 24 hours a day, 7 days a week).
G. If applicable:
   (1) Detail the portions of roadway, driveways and parking spaces that will be temporarily blocked or unavailable for public use and the alternative measures that will be provided.
   (2) Description of traffic control measures to be implemented.
   (3) The Contractor shall submit draft copies of all notices to the Project Manager for approval a minimum of twenty-one (21) calendar days prior to sending the notices to affected property owners, lessees, community groups and government agencies.
   (4) Copies of all notices shall be submitted to the Project Manager at the same time they are mailed to property owners, lessees, community groups, and government agencies.
H The Contractor shall maintain a notification log which will include date and time of notification, the contact person's name, and the notation that the information was left at the person's door if no contact was made.

1.02 ADDITIONAL INFORMATION BY THE CONTRACTOR

The Contractor shall notify all businesses, owners and residents of properties abutting the improvements of the impending construction work, and residents in the immediate areas affected by road closures, with a written flyer distributed at least fourteen (14) calendar days but not more than twenty-one (21) calendar days prior to commencing construction in the affected area. The flyer shall include the expected starting date and duration of work. The flyer shall include specific information on road and lane closures, and directions for affected businesses and residents on how to ingress and egress "local traffic only areas" to access their properties. Information on specific dates and times of electrical, water, sewer, gas, telephone, cable and other utility outages shall be provided in the flyer or separate attachment. Updated information shall be distributed as required to those affected if there are changes to the schedules and information provided. The flyer information shall be forwarded to the Project Manager for review at least ten (10) calendar days prior to the scheduled date of the flyer distribution. The flyer shall be mailed to apartments that cannot be accessed due to security restrictions. The Project Manager will provide the Contractor with an address database for use in mailing the flyers.

The Contractor shall also publish a legal notice in the Honolulu Star Advertiser for three (3) consecutive days, one week prior to starting work on this project, to inform the public of the proposed work. The legal notice shall be in accordance with the current State of Hawai'i, Department of Transportation, Standard Specifications for Road and Bridge Construction, Subsection 645.03(H) – Advertisement. See 01030 Legal Notice for more

details.

1.03 ADDITIONAL NOTIFICATIONS FOR WORK WITHIN EASEMENTS

Where work within sewer easements in private property is required, the Contractor shall notify each property owner affected of the approximate starting date and total duration of work within the property. The written notification shall be made at least sixty (60) calendar days prior to starting work within the property to allow the residents and business owners to remove obstructions and prepare for the work. The Contractor shall also provide an additional written flyer notice to the property owners at least fourteen (14) calendar days but not more than twenty-one (21) calendar days prior to commencing the work indicating the exact starting date and expected duration of the work. In addition, the Contractor shall notify each individual property owner affected by the work one (1) to two (2) calendar days prior to commencement of work in the immediate area. A copy of all notifications shall be forwarded to the Project Manager.

1.04 PUBLIC INFORMATION MEETINGS

The Contractor is required to make arrangements for and conduct one public informational meeting to the general public to be held approximately one month prior to the start of construction. The Contractor shall respond to any questions during the presentation. Public notification for the meeting shall be published in the Honolulu Star-Advertiser and Mid-Week at least two (2) weeks prior to the meeting. Notice of the meeting shall also be posted on the DHHL website.

The Contractor shall prepare and give initial presentations at the community association meetings. The Contractor shall provide follow-up presentations and attend community association meetings, as requested, to provide updates on the project. Contractor shall attend up to three (3) informational meetings to inform the public and/or affected residents at the Project Manager's request at no charge to the DHHL.

The Contractor shall schedule and attend meetings and conferences as directed by the Project Manager. Refer to Section 01320, "Project Management and Progress Documentation" for Progress Meetings.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01120 – ACCESS TO AND PROTECTION OF PROPERTY

PART 1 - GENERAL

This section shall supplement Section 7.17, Protection of Persons and Property, and Section 7.46, Utilities and Services, of the DHHL CONSTRUCTION GENERAL INSTRUCTIONS.

1.01 PEDESTRIAN AND VEHICULAR ACCESS TO PROPERTIES

The Contractor shall provide pedestrian and vehicular access into properties abutting the project site at all times unless other arrangements are made in advance with the property owners and residents. The Contractor shall take all measures necessary to ensure that normal and alternate access provided is safe and convenient. Driveways and other access points to private properties may be temporarily closed to vehicle and pedestrian access only if the affected property owners or residents are otherwise provided for satisfactorily, including providing satisfactory alternate parking locations and access routes. For access blockages lasting more than two consecutive days due to longer-term use of driveways and other access areas for required roadside staging, operations and construction areas, the Contractor shall negotiate directly with individual owners for the use of the area and blockage of access. Any compensation provided to the property owner shall be at the Contractor's own cost. The Contractor shall document all terms and agreements with the property owners in writing, and two (2) copies of all agreements with signatures of all parties involved shall be forwarded to the Project Manager within seven (7) calendar days of consummation of the agreement. All alternate accesses provided by the Contractor shall conform to any and all applicable accessibility requirements pursuant to the Americans with Disabilities Act and related regulations and guidelines.

1.02 EMERGENCY VEHICLE ACCESS TO PROPERTIES

The existing accesses available for emergency vehicles (i.e., ambulances, fire trucks) to reach all properties in and adjacent to the project site shall be maintained at all times. The Contractor shall be prepared at all times to immediately cover or plate excavations, remove construction personnel, materials, debris, equipment, or any other hindrances to provide alternate measures in order to satisfactorily accommodate emergency vehicles and personnel. The Contractor shall be liable for any damages resulting from his or her failure or delay in providing such access or alternate measures.

1.03 FAILURE TO COMPLY WITH THE ABOVE CONDITIONS

If the Contractor fails to comply satisfactorily with any clauses of this special provision, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action is taken. No extension of time or payment for excess costs or damages shall be made for the time lost due to such stop action.

1.04 PROTECTION

The property to be protected shall include, but not be limited to, all existing improvements, utility lines, roadways, pavements, driveways, fence, etc., that are adjacent to the site of the Project and not noted on the PLANS for removal. Property that has been damaged by the Contractor shall be immediately restored to the condition it was in prior to being damaged, to the extent that such restoration is reasonably possible, and to the satisfaction of the Project Manager. Unless otherwise indicated on the plans, surface encroachments (i.e. privately owned improvements, structures, plants, and shrubbery) within the DHHL right-of- ways and sewer easements shall be restored. The Contractor shall refer to Section 01505, "Prior Notice of Removal of Surface Encroachment", of this SPECIAL PROVISIONS.

The Contractor shall refer to pre- and post-construction site survey requirements of SPECIAL PROVISIONS Section 01770, "Pre and Post Construction Surveys".

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01210 – ALLOWANCES

PART 1 – GENERAL

This section shall supplement Section 4.5 "Allowances for Overhead and Profit (§3-125-13 HAR) of the DHHL CONSTRUCTION GENERAL CONDITIONS and SC-06 "Allowances", of the SPECIAL CONDITIONS.

Any allowance amount specified in the bid is to be considered an estimate of the amount required for the purpose specified and shall be included in the Offeror's total sum bid. The Contractor shall be reimbursed upon submittal of proof of payment, unless otherwise specified.

For costs incurred by the following utility companies for temporary or permanent relocations of their improvements (lines, ducts, poles, etc.), the Contractor shall be reimbursed only if the Project Manager determines, prior to commencement of relocation work, that the relocations are necessary due to conflicts with the installation of the proposed Project improvements or are necessary because the utilities pose safety hazards to the Contractor. The Contractor shall be reimbursed only for the direct costs based on the utility companies' invoice cost to the Contractor. Additional charges by the Contractor for overhead, profit, coordination, taxes, insurance and bond fee, and other necessary expenses shall not be allowed. The utility companies shall bill the Contractor directly, including but not being limited to the following

1. Hawaiian Electric Company
2. Hawaiian Telcom
3. Sandwich Isles Communications
4. Spectrum
5. Board of Water Supply

The State reserves the right for the recovery of the above fees from the utility companies.

The Contractor shall refer to SECTION 01510, EXISTING UTILITIES.

For costs incurred by other allowance work, the Contractor shall refer to SC-06, ALLOWANCES.

In the event that the amount specified in the allowance item is insufficient, the Project Manager, with approval of the Contracting Officer, will issue a supplemental agreement in writing to increase the allowance amount. Any amount remaining at the completion of the contract will remain with the State upon completion of the work order. The Contractor shall make no claim in the event the State chooses to delete the allowance item from the Contract.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01300 – SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 GENERAL: Where required by the specifications the Contractor shall submit descriptive information which will enable the Project Manager to advise whether the Contractor's proposed materials, equipment or methods of work are in general conformance to the design concept and in compliance with the Contract Documents.

Shop drawings and submittals shall be made in accordance with Section 5.5 – "Shop Drawings and Other Submittals" of the DHHL CONSTRUCTION GENERAL CONDITIONS.

The information to be submitted shall consist of:

- Drawings
- Specifications
- Manufacturer's Instruction Manuals
- List of Deviations
- Performance Schedule
- Submittal Schedule
- Laboratory Test/Reports
- Descriptive Data
- Certificates
- Samples
- Test Results and such other information, all as specifically required in the specifications.

1.02 CONTRACTOR'S RESPONSIBILITIES

A. GENERAL

1. The Contractor shall be responsible for the accuracy and completeness of the information contained in each submittal and shall assure that the material, equipment or method of work shall be as described in the submittal. Submittals shall contain all required information, including satisfactory identification of items, units, and assemblies in relation to the contract drawings and specifications. The Contractor shall verify that the material and equipment described in each submittal conform to the requirements of the Contract Documents. Submittals shall be made only by the Contractor, who shall indicate by a signed stamp, in accordance with paragraph 1.02.A.5, on the submittals, that the Contractor has checked the submittals, and that the work shown conforms to contract requirements and has been checked for dimensions and relationship with work of all other trades involved. If the information shows deviations from the specifications or drawings, the Contractor, by statement in

writing accompanying the information, shall identify the deviations and state the reason(s) therefore.

The Contractor shall ensure that there is no conflict with other submittals and shall notify the Project Manager in each case where its submittal may affect the work of another contractor or DHHL. The Contractor shall ensure coordination of submittals among the related crafts and subcontractors.

2. To expedite the submittal procedures, the Project Manager shall be allowed to contact directly all material or equipment suppliers for necessary information that is missing in the submittal. The supplier shall be responsible for documenting the discussion and coordinating with the Contractor. The Contractor shall be responsible for the accuracy and completeness of information contained in all submittals.

3. All equipment and manufacturer's instruction submittals, including follow-up submittals, shall be submitted no later than 30 calendar days following the Notice to Proceed nor later than the time necessary to procure the item or avoid schedule delays as established in the Contractor's construction schedule.

4. The Contractor is responsible for the coordination of all contractual work and submittals.

5. The Contractor shall maintain at the job site two sets of full size contract drawings, marking them in red to show all variations between the construction actually provided and that indicated or specified in the contract documents, including buried or concealed herein, or where variations in scope or character of work from that of the original contract are authorized, the drawings shall be marked to define the construction actually provided. Where equipment installation is involved, the size, manufacturer's name, model number and power input or output characteristics that are applicable shall be shown on the As-Built drawings. The representations of such changes shall conform to standard and details as necessary to clearly portray the as-built construction.

6. All changes made to the submittal drawings by the Contractor in the form of written or typewritten markings shall be initialed and dated by the Contractor.

7. The stamp below, certified by the Contractor, shall appear on the title sheet of each shop drawing, on a cover sheet of submittals in an 8-1/2" x 11" format, or on one face of a cardstock tag (min. 3" x 6") securely attached to each sample. The tag shall clearly identify the nature of the sample. The back of this tag will be used by the Project Manager for

his/her receipt, review, and log stamp and for any comments that relate to the sample.

CONTRACTOR NAME

PROJECT: _____
_____

JOB NO: _____

THIS SUBMITTAL HAS BEEN CHECKED BY THIS GENERAL CONTRACTOR. IT IS CERTIFIED CORRECT, COMPLETE, AND IN COMPLIANCE WITH CONTRACT DRAWINGS AND SPECIFICATIONS. ALL AFFECTED CONTRACTORS AND SUPPLIERS ARE AWARE OF, AND WILL INTEGRATE THIS SUBMITTAL INTO THEIR OWN WORK.

SUBMITTAL NO. _____
DESCRIPTION_____
DATE RECEIVED _____
SPECIFICATION SECTION _____
SPECIFICATION PARAGRAPH _____
DRAWING NUMBER_____
SUBCONTRACTOR NAME_____
SUPPLIER NAME _____
MANUFACTURER NAME_____
NUMBER OF DEVIATIONS _____
EXCEPTIONS TAKEN: Yes _____ No _____

DETAILS OF EXCEPTION_____
_____
_____

CERTIFIED BY: _____

8. The person signing the Contractor's submittal stamp shall be the one designated under the contract agreement with the DHHL. The signature shall be in original ink. Stamped signature will not be acceptable. Submittal form shall be completely filled out, signed and dated.

9. When the Contractor takes any exception to the submittal drawings, such exception shall be brought to the attention of the Project Manager. The exception shall be submitted with the shop drawings together with sufficient details and justifications.

B. SUBMITTALS: Submittals referred to herein shall include shop drawings and other submittals for both shop and field-fabricated items.

The submittals shall include satisfactory identification of items, units, and assemblies in relation to the Specification section number, and the system or equipment identification shown on the Drawings, or as provided in the applicable specification section.

Should the Contractor propose any item on his/her shop drawings, or incorporate an item into the work, and that item should subsequently prove to be defective or otherwise unsatisfactory, (regardless of the Project Manager's preliminary review), the Contractor shall, at his/her own expense, replace the item with another item that will perform satisfactorily.

C. PERFORMANCE (CONSTRUCTION) SCHEDULE: The Contractor shall provide a construction schedule for scheduling and coordinating the work within the contract time. Approved contract time extensions shall be incorporated into updated schedules, reflecting their effect at the time of occurrence. Failure of the Contractor to comply with these requirements for submittal of the performance schedule and reports shall be cause for no payments by the Owner. Project status review and updates shall be provided each month and submitted with progress payment requests.

D. SUBMITTAL SCHEDULE: Within 30 days after receipt of Notice to Proceed, the Contractor shall submit in duplicate to the Project Manager a schedule, listing all items that will be submitted to the Project Manager for review and approval. The schedule shall include, among other things, a list of shop drawings and manufacturer's literature, certificates of compliance, material samples, and guarantees. The schedule shall indicate the type of item, contract requirement reference, the Contractor's scheduled dates for submitting the above items and projected needs for approval answers and procurement dates. In preparing the schedule, the Contractor shall allow the appropriate time for the Project Manager's review and approval as stated in the DHHL CONSTRUCTION GENERAL CONDITIONS, Section 5.5; additional time shall be allowed to provide for possible resubmittal. Also, the scheduling shall be coordinated with the approved progress schedule.

E. SUBMITTALS REQUIRED FOR FOREIGN-MANUFACTURED ITEMS: In addition to the submittal requirements stated above, suppliers of foreign-manufactured items shall submit in English the names and addresses of companies within the United States that maintain technical service representatives and a complete inventory of spare parts and accessories for each foreign-made item proposed for incorporation into the work. Failure to prove the foregoing capabilities shall be just cause for rejection of the foreign-manufactured items.

F. RECORD DOCUMENTS: Record documents shall be submitted by the Contractor in conformance with SECTION 01785, "PROJECT RECORD DOCUMENTS".

G. SAMPLES AND TESTING: Where required in the Specifications, and as determined necessary by the Project Manager, samples of materials, appliances, and fittings to be used or offered for use in connection with the work shall be submitted to the Project Manager at the Contractor's expense, with information as to their sources, with all shipping charges prepaid, and in such quantities and sizes as may be required for proper examination to establish the quality or equality thereof, as applicable.

All samples shall be submitted in ample time to enable the Project Manager to make any necessary examinations, without delay to the work. The Contractor will be held responsible for any loss of time due to his/her neglect or failure to deliver the required samples to the Project Manager, as specified.

Samples also shall be taken during the course of the work, as required by the Project Manager.

Laboratory tests and examinations that the Project Manager elects to make in its own laboratory will be made at no cost to the Contractor, except that, if a sample of any material or equipment proposed for use by the Contractor fails to meet the Specifications, the cost of testing subsequent samples shall be borne by the Contractor.

All tests required by the Specifications to be performed by an independent laboratory shall be made at the sole expense of the Contractor.

Material used in the work shall conform with the submitted samples and test certificates as approved by the Project Manager.

H. COST FOR SERVICES: Costs for providing services during installation and testing shall be included in the costs for providing the applicable specified equipment.

1.03 TRANSMITTAL PROCEDURE:

A. General: A separate form shall be used for each specific item, class of material, equipment, and items specified in separate, discrete sections, for which the submittal is required. Submittals of various items shall be made with a single form when the items taken together constitute a manufacturer's package or are so functionally related that expediency indicates checking or review of the group or package as a whole. The Contractor shall clearly label different submittal items in a submittal package if that package contains more than one submittal items required by the contract.

B. A unique number, sequentially assigned, shall be noted on the transmittal form accompanying each item submitted. Original submittal numbers shall have the following format: "XXX"; where "XXX" is the sequential number assigned by the Contractor. Resubmittals shall have the following format: "XXX-Y"; where "XXX" is the originally assigned submittal number and "Y" is a sequential letter assigned for resubmittals, i.e., A, B, or C being the 1st, 2nd, and 3rd resubmittals, respectively. Submittal 25B, for example, is the second resubmittal of Submittal 25. The resubmittals shall be a complete set and not just the portions that have been changed.

C. CONTACT:
Department of Hawaiian Home Lands
91-5420 Kapolei Parkway
Kapolei, Hawai‘i 96707

Attention: Ms. Sara Okuda

D. Deviation from Contract: If the Contractor proposes to provide material or equipment which does not conform to the specifications and drawings, it shall indicate so under "deviations" on the submittal transmittal form accompanying the submittal copies. The Contractor shall prepare its reason for a change, including cost and time differential. The contractor shall be responsible for omission or deviation in the submittal. Failure to identify deviation shall be subject to rejection of the submittal without review.

E. Submittal Completeness: Submittals which do not have all the information required to be submitted, including deviations, shall be considered as not complying with the intent of the contract and are not acceptable and will be returned without review. Contractor is advised to review and assure that all submittals are complete prior to submittal to the Project Manager.

1.04 REVIEW PROCEDURE:

A. When the contract requires a submittal, the Contractor shall submit to the Project Manager for review, the specified information in accordance with the General Conditions and as follows:

1. **One (1)** searchable electronic copy of the submittal. Review time starts after both electronic and hard copies are received.

2. **Four (4) copies** of all the submitted information.

3. Only **one (1) set of sample** materials need be submitted, unless otherwise directed by the Project Manager.

B. Unless otherwise specified, within **30 calendar days** after receipt of the submittal by the Project Manager the submittal shall be reviewed and the Project Manager shall return **(1) copy** of the marked-up submittal or detailed shop drawing

comment forms. The returned submittal shall indicate one of the following actions:

If the review indicates that the material, equipment or work method is in general conformance with the design concept and complies with the drawings and specifications, submittal copies will be marked **"NO EXCEPTIONS TAKEN."** In this event the Contractor may begin to implement the work method or incorporate the material or equipment covered by the submittal.

If the review indicates minor corrections are required, copies will be marked **"MAKE CORRECTIONS NOTED."** The Contractor may begin implementing the work method or incorporating the material and equipment covered by the submittal in accordance with the noted corrections. Where submittal information will be incorporated in the O&M data, a corrected copy shall be provided in the O&M Manual.

If the review reveals that the submittal is insufficient or contains incorrect data, copies will be marked **"REVISE AND RESUBMIT."** Except at his/her own risk, the Contractor shall not undertake work covered by this submittal until the submittal has been revised, resubmitted and returned and marked either "NO EXCEPTIONS TAKEN," or "MAKE CORRECTIONS NOTED."

If the review indicates that the material, equipment, or work method is not in general conformance with the design concept or in compliance with the drawings and specifications, copies of the submittal will be marked **"REJECTED."** Submittals with deviations which have not been identified clearly may be rejected. Except at its own risk, the Contractor shall not undertake work covered by such submittals until a new submittal is made and returned marked either "NO EXCEPTIONS TAKEN", or "MAKE CORRECTIONS NOTED."

C. No changes shall be made by the Contractor. The resubmittals shall be a complete set and not just the portions that have been changed.

D. Unless otherwise approved by the Project Manager, shop drawings shall be submitted only by the Contractor, who shall indicate by a signed stamp on the drawings or other approved means that the Contractor has checked the shop drawings and that the work or equipment shown is in accordance with contract requirements and has been checked for dimensions and relationship with work of all other trades involved. All deviations from the plans and specifications shall be listed. The practice of submitting incomplete or unchecked shop drawings for the Project Manager to correct or finish will not be acceptable, and shop drawings which, in the opinion of the Project Manager, clearly indicate that they have not been checked by the Contractor will be considered as not complying with the intent of the contract documents and will be returned to the Contractor for resubmission in the proper form.

E. The Project Manager shall be allowed by the Contractor to contact manufacturers, dealers, vendors, suppliers, and subcontractors directly for the sole purpose of expediting the submittal process.

1.05 EFFECT OF REVIEW OF CONTRACTOR'S SUBMITTALS:

A. The Project Manager's review of drawings, methods of work, or information regarding materials or equipment the Contractor proposes to provide, shall not relieve the Contractor of its responsibility for errors therein and shall not be regarded as an assumption of risks or liability by the Owner or by any officer, employee, agent, consultants or subcontractor thereof, and the Contractor shall have no claim under the contract on account of the failure, or partial failure, of the method of work, material, or equipment so reviewed, unless the Contractor has called attention to such deviations, in writing, by a letter accompanying the drawings and the DHHL approved the change or deviations, in writing, at the time of submission; nor shall review by the Project Manager relieve the Contractor from the responsibility for errors in the shop drawings. When the Contractor does call such deviations to the attention of the Project Manager, he/she shall state in his/her letter whether or not such deviations involve any deduction or extra cost adjustment. A mark of "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED" shall mean that the DHHL has no objection to the Contractor, upon its own responsibility, using the plan or method of work proposed or providing the material or equipment proposed.

B. If such deviation is not indicated to the Project Manager in writing, and such deviation is inadvertently approved, such approval will be rescinded and any cost related to redoing the work to conform with the plans and specifications shall be borne by the Contractor.

C. The approval of the above drawings, lists, prints, specifications, or other data shall in no way release the Contractor from his/her responsibility for the proper fulfillment of the requirements of this contract nor for fulfilling the purpose of the installation nor from his/her liability to replace the same should it prove defective or fail to meet the specified requirements.

PARTS 2 - PRODUCTS (Not Used)

PARTS 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01310 - PAYMENT AND PERFORMANCE SCHEDULES

This special provision shall supplement SC-16 "Schedule of Prices", of the SPECIAL CONDITIONS, and Subsection 7.2.4, "Schedule of Prices", of the DHHL CONSTRUCTION GENERAL CONDITIONS.

PART 1 – GENERAL

1.01 DESCRIPTION

This Section includes specifications for the preparation, updating, revision, and submittal of project progress schedules and the Monthly Progress Status Report. Progress schedules required include the Project Schedule, Updated Project Schedule, and Four-Week Work Plan Schedule. Unless otherwise directed by the Project Manager, the submittal of a project payment schedule detailing the anticipated monthly payments based upon the project progress schedule.

A. Progress schedules shall represent a practical plan to complete the Work within the Contract time(s) of completion indicated, and shall convey the Contractor's intent in the manner of prosecution and progress of the Work.

B. The scheduling and execution of construction in accordance with the Contract Documents are the responsibility of the Contractor. The Contractor shall involve and coordinate all Subcontractors and material Suppliers in the development and updating of progress schedules.

C. The submittal of progress schedules shall be understood to be the Contractor's representation that the progress schedule meets the requirements of the Contract Documents and that the Work will be executed in the sequence and duration indicated in the progress schedule.

D. The payment schedule shall list and detail the anticipated monthly payments based upon the progress schedule to meet the requirements of the Contract Documents and shall be used by the DHHL as a guide for Project budgeting purposes.

1.02 SCHEDULING FORMAT

A. The Project Schedule shall be computer produced in the Critical Path Method (CPM) format. The schedule shall be computer produced utilizing project scheduling software such as Microsoft Project, or approved substitute software as approved by the Project Manager.

B. The Project Schedule shall be updated monthly and submitted as indicated in Section 01300, "Submittal Procedures".

C. The schedule shall show Contract tasks, percent complete, progress bars, baseline schedules, milestones, start and finish dates, and other breakdowns as required by the Project Manager. The schedules shall show clearly the sequence of activities and shall list specifically the following activities:

1) Interim milestone completion dates. Phasing and staging of the Work as specified shall be prominently identified.

2) Submittals and the Project Manager's review of submittals.

3) DHHL inspection of the Work, including Preliminary Final Inspection, Final Inspection, punch list(s), and Acceptance.

4) Acquisition of permits.

5) Any long lead time (over 60 days) orders for material and equipment

6) Work to be performed by other contractors or agencies.

7) Delivery of DHHL-furnished equipment and materials indicated for incorporation in the Work.

D. Descriptions of scheduled activities shall include sufficient detail to identify the work, which is to be accomplished.

1) The schedule shall contain sufficient activities to clearly show the sequence and interdependencies of the Work. The schedule shall be prepared in such a way that an activity or group of activities will correspond directly with the bid item breakdown and/or the breakdown of lump sum bid items. The Project Manager may request that additional activities be added.

2) Activity durations shall be expressed in whole days. Work that is to be performed by Subcontract shall be clearly defined.

3) Float suppression techniques, such as preferential sequencing (crew movement, equipment use, and form reuse), extended duration, imposed dates, scheduling of work not required for the Contract, and others, shall not be used to affect or limit float in the schedule. The use of constraint dates should be minimized, and must be approved by the Project Manager.

4) Critical Path activities are those activities with a total float equal to or less than zero. Schedules with negative total float may be found to be impractical by the Project Manager.

E. A schedule showing that Work, which is completed in less than the completion

time, specified may be found to be impractical by the Project Manager.

F. A schedule showing that Work which is completed in less than the completion time specified, which is found to be practical by the Project Manager, shall be considered to have float. The float shall be the time between the scheduled completion of the Work and the Contract completion date. Float time shall not be for the exclusive benefit of either the DHHL or the Contractor. Float shall be a resource available to both parties.

G. A schedule found to be impractical for the preceding reasons or any other reasons shall be revised by the Contractor and resubmitted.

1.03 FOUR-WEEK WORK PLAN

A. A schedule in calendar time-scaled bar chart format depicting the Contractor's intended work activities for the upcoming four-week period shall be submitted on a weekly basis and shall be due on the first working day of each week. Each activity of one day or more in duration shall be indicated.

B. Any deviations, such as sequences of work, timing, and durations of activities from the approved Project Schedule, shall be noted and explained in writing.

C. The Four-Week Work Plan shall be submitted on sheets not less than 8-1/2 inches by 11 inches, or as approved by the Project Manager.

1.04 MONTHLY PROGRESS STATUS REPORT

A. The Monthly Progress Status Report shall be a narrative report that describes work activities accomplished in the reporting period, intended work activities for the upcoming reporting period, problems and actions intended by the Contractor to mitigate the problems, work that is being performed out of sequence with approved schedules, status of Change Orders, Notices of Potential Claims, status of submittals, and status of Contractor procurement items.

B. The Contractor shall submit the report format and obtain the Project Manager's approval of the format.

C. The Monthly Progress Status Report shall be submitted monthly on sheets no larger than 11 inches by 17 inches, nor any smaller than 8-1/2 inches by 11 inches.

1.05 REVIEW, UPDATES, AND REVISIONS

A. The Project Manager will review and return the Contractor's schedule submittals with written comments according to the following schedule from the date of receipt. Project CPM Schedule: 10 calendar days. Four-Week Work Plan: 5

calendar days.

B. The Contractor shall make all corrections to the Project Schedule requested by the Project Manager and resubmit the schedule for approval. If the Contractor does not agree with the Project Manager's comments, the Contractor shall provide written notice of disagreement within five days from the receipt of the Project Manager's comments. The Project Manager's comments on the Four-Week Work Plan for which the Contractor disagrees shall be resolved in a meeting held for that purpose, if necessary.

C. At least once each month, or as often as deemed necessary by the Project Manager, the Contractor shall submit an updated schedule showing the progress of the Work to date and anticipated activities to be worked on, and the Monthly Progress Status Report as specified in Subsection 1.04, Monthly Progress Status Report. The submittal of the Project Schedule update and Monthly Progress Status Report shall be at least five days prior to the submittal of a payment invoice. No invoice will be accepted, nor payment made if there is not an approved current update in place.

D. If, according to the approved Project Schedule, the Contractor is thirty or more days behind the Contract completion date of any milestone indicated, or the schedule contains 30 or more days of negative float, considering all approved time extensions, the Contractor shall submit a revised schedule, showing a practical plan to complete the Work within the specified Contract completion time. The DHHL may withhold progress payments until a revised schedule, acceptable to the Project Manager, is submitted by the Contractor.

1.06 REQUESTS FOR TIME EXTENSIONS

A. If the Contractor requests an extension of time for the completion of an interim milestone date or Contract completion date of the Work, the Contractor shall furnish necessary justification for such extension so that the Project Manager can determine whether or not the Contractor is entitled to an extension of time under the provisions of the Contract. Submission of proof based on revised activity logic, duration, and costs is obligatory to any approvals. The cost of such justification or subsequent schedule revisions shall be borne solely by the Contractor.

1) The schedule shall clearly display that the Contractor has used, in full, all the float time available for the work involved in its request.

2) The Project Manager's determination as to the total number of days of Contract extension will be based upon the current schedule for the time period in question, and all other relevant information. Actual delays in activities which, according to the schedule, do not affect the extended and predicted Contract completion dates as shown by the critical path, will not

be the basis for a change to the Contract completion date.

3) After receipt of such justification and supporting evidence, the Project Manager will review the facts and advise the Contractor in writing of the Project Manager's decision. If the Project Manager determines that the Contractor is entitled to an extension of time to an interim milestone, the Contract completion date will remain the same, unless the Project Manager specifies another date. Any change to Contract milestones or to the Contract completion date will be made by Change Order.

B. As part of each request for extension, a fragment showing all schedule logic revisions, duration changes, and cost changes for the work in question and its relationship to other activities on the Project Schedule shall be submitted.

1) If the Project Manager has not yet made a full determination as to the amount of time extension to be granted and the parties are unable to agree as to the amount of extension to be reflected in the schedule, the Contractor shall reflect that amount of time extension in the schedule as determined to be appropriate by the Project Manager for such interim purpose. It is understood and agreed that such interim determination by the Project Manager will not be binding upon either party for any other purpose, and that, after the Project Manager has made a final determination as to any time extension, the Contractor shall revise the schedule in accordance with the final decision.

1.07 SUBMITTALS

A. Schedules shall be submitted in time-scaled bar-chart (Gantt) format with logic lines shown on sheets no smaller than 22 inches wide by 34 inches long, nor larger than 34 inches wide by 44 inches long. A time-scaled logic network diagram may also be required by the Project Manager. An activity report in a tabular form showing the following information shall be submitted with bar-chart: activity ID, description, duration, total float, early start, early finish, late start, late finish, predecessors, successors, constrains, percent complete, and remaining duration.

B. Payment Schedule: Within 7 calendar days of the official commencement date in the Notice to Proceed or within such further time as the Project Manager may allow, the Contractor shall submit an itemized breakdown of lump sum bid items for the Project Manager's approval and for subsequent use as a guide in determining progress payments. No progress payments will be processed until both parties agree to an acceptable breakdown of these bid items. The Contractor shall submit a tentative payment schedule to coincide with submittal of his preliminary performance schedule.

C. All schedule submittals shall include one reproducible and three (3) full-size

copies.

D. Schedule submittals will be reviewed by the Project Manager, and shall be updated and revised as indicated in Subsection 1.05, Review, Updates, and Revisions. Resubmittals shall conform to the same requirements as original submittals.

E. The Contractor shall prepare and submit all schedules and schedule analysis reports in electronic format on CD ROM disk as well as hard copies.

F. All progress schedule submittals are subject to review and approval by the Project Manager. The Project Manager retains the right to withhold progress payments until the Contractor submits a progress schedule and progress schedule updates acceptable to the DHHL.

G. The Contractor shall submit the schedule within 7 calendar days after the date of the Notice to Proceed.

H. The first of each type of schedule and the first Progress Status Report submitted by the Contractor will be reviewed for format, as well as content. The Project Manager may request format changes. Once the format has been approved, all subsequent Schedules and Progress Status Reports shall be submitted in the approved format.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01320 – PROJECT MANAGEMENT AND PROGRESS DOCUMENTATION

PART 1 – GENERAL

1.01 SUMMARY: This Section includes administrative and procedural requirements for management of the project and documenting the progress of construction during performance of the Work, including the following:

1. Project Meetings.
2. Progress Reports.

1.02 PROJECT MEETINGS:

A. Preconstruction Conference: The Project Manager may schedule a preconstruction conference before the start of construction, at a time convenient to the Project Manager, but no later than seven (7) days before the Project start date or jobsite start date whichever is later. Conference will be held at the Project site or another convenient location. The Project Manager shall conduct the meeting to review responsibilities and personnel assignments.

B. Progress Meetings: The Contractor shall schedule and attend meetings and conferences as directed by the Project Manager.

1. Agenda: Items to be discussed at the progress meetings are:
    a. Construction Schedule
    b. Outstanding requests for information (clarification)
    c. Interface requirements
    d. Sequence of operations
    e. Status of outstanding submittals
    f. Deliveries
    g. Off-site fabrication
    h. Access
    i. Site utilization
    j. Temporary facilities and controls
    k. Work hours
    l. Hazards and risks
    m. Progress cleaning
    n. Quality and work standards
    o. Change Orders and Change Proposals
    p. Documentation of information for payment requests

2. Contractor's Construction Schedule: The Contractor shall review progress since the last meeting and:

    a. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule.

b. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so.
c. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

3. Corrective Action Plan: The Contractor shall provide a plan of corrective action for any item which is delayed or expected to be delayed, then that item impacts the contractual dates.

4. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

1.03 PROGRESS REPORTS:

A. The General Contractor and all Subcontractors shall keep a daily report of events per SC-19, CONTRACTOR'S DAILY REPORT, of the SPECIAL CONDITIONS.

B. The form of the Contractor Daily Progress Report shall be as directed by the Project Manager.

C. Submit copies of the previous week's reports on Monday morning at 10:00 a.m.

D. Submit copies of the reports with the monthly payment request for the whole period since the last payment request submittal.

E. Deliver the reports in hard copy or by e-mail as directed by the Project Manager.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01350 – TRAFFIC CONTROL

PART 1 - GENERAL

The Contractor shall perform traffic control work required under this Contract. Traffic control work implemented by the Contractor shall comply with the approved plans and satisfy the requirements of this special provision. Traffic control work required for sewer flow control and bypassing shall be as specified in SECTION 02731, "Sewer Flow Control." The requirements of SECTION 01410, "Permits and Licenses, and SECTION 01520, "Work on Streets Maintained by City" shall be referenced and appropriately coordinated.

1.01 DESCRIPTION

A. This section shall govern developing site specific control plans. Furnishing, installing, maintaining, and subsequently removing traffic control devices to control traffic during construction as specified herein. The work shall also include services from special duty police officers. The work shall conform to applicable provisions of the "Manual on Uniform Traffic Control Devices for Streets and Highways" (MUTCD), as amended, published by the Federal Highway Administration, the GENERAL CONDITIONS, and the final approved traffic control plans.

B. Traffic control plans were prepared based on construction work performance at locations indicated on the plans. **If construction methods and procedures differ from the assumed basis, the Contractor shall modify the traffic control plans to fit his/her schedule and location of activities.** The modified traffic control plans suitable for the Contractor's purposes shall be designed and stamped by a civil engineer licensed in the State of Hawai'i. The design, implementation and associated costs for the Contractor's modified traffic control plans, and obtaining approvals from the City Department of Transportation Services (DTS) and/or Department of Planning and Permitting (DPP) – Traffic Review Branch, shall be the responsibility of the Contractor. No additional time shall be allowed for the design or processing for approval of the Contractor's modified traffic control plans, unless otherwise agreed to by the Project Manager.

C. No work on any right-of-way shall be allowed until traffic control plans and applicable permits covering the Project work have been approved by the appropriate government agencies.

1.02 SUBMITTALS

A. Traffic control plans: The Contractor shall be responsible for obtaining the applicable approvals/permits (e.g. street usage permit) from DTS and/or DPP, for his/her properly designed and modified traffic control plans. The Contractor's traffic control plans shall include the following:

1) Traffic control notes
2) All signs and their placement
3) All traffic movements indicated by arrows
4) Positions of special duty police officers
5) All barricades, cones, delineators, signs and their placement
6) Any other pertinent information

Two (2) copies of each submittal of the Contractor's traffic control plans to DTS and/or DPP, shall also be submitted to the Project Manager. Upon final approval, two (2) copies of the Contractor's approved traffic control plans shall be submitted to the Project Manager.

B. Schedules: The Contractor shall submit schedules in writing to the Project Manager for lane and road closures and detours in accordance with the approved traffic control plans and permits. The submittal shall contain a brief description of the work and the time when the work is to be done and shall conform to the traffic control plans and permits. The schedules shall be submitted 10 calendar days before the date such lane and road closures and detours are scheduled to begin.

1.03 MATERIALS

Materials shall meet all applicable Contract and regulatory agencies' requirements.

1.04 DETAILS

A. All barricades, signs, cones, barriers, lights, flashing signals, and other traffic control devices shall be furnished, installed and maintained as shown on the approved traffic control plans and in accordance with the requirements of the Contract. In event of conflict between provisions cited therein, the more restrictive laws, rules, regulations or requirements shall apply. The approved traffic control plans and this section specify the minimum requirements for traffic control work for the Project.

B. Construction within and on public and private streets shall be limited to the hours designated on the plans, unless otherwise specified in these or approved by appropriate City and State agencies.

C. During non-working hours or during any suspension of work, open trenches and other excavations shall be covered with anchored non-skid steel plates. Worn non-skid surfaces that do not provide proper skid resistance shall not be used.

D. No materials or equipment shall be stored where they shall interfere with the free and safe passage of public traffic. At the end of each day's work or when construction activities are suspended for any reason, the Contractor shall remove all materials, equipment and other obstructions to permit free and safe passage of public traffic.

E. All barricades, construction and warning signs, and other traffic control devices shall be kept in good condition throughout their usage. The Contractor shall repair, repaint, clean, or replace the barricades, signs or other devices as necessary to maintain their effectiveness and appearance or as directed by the Project Manager. The Project Manager shall be the sole judge in determining the suitable condition of each barricade, sign, or other traffic control device.

F. Existing regulatory and warning signs within the construction zone that are in conflict with the traffic control plans shall be removed or covered. All construction warning signs shall be promptly removed or covered whenever the message is not applicable or not in use. All signs shall be restored upon the completion of the work.

G. During any suspension of work, the Contractor shall provide for public traffic to pass through the work over a reasonably smooth and even surface and with as little inconvenience and delay as possible.

H. Detours not specifically provided for on the Contractor's approved traffic control plans (for passage of public traffic) to facilitate the Contractor's operations or detours used exclusively by the Contractor for hauling materials and equipment shall be constructed, maintained and removed by the Contractor at his expense. The Project Manager will have the authority to regulate the Contractor's hauling over such detour if such hauling, in the judgment of the Project Manager, interferes with the free and safe passage of public traffic.

I. All detours shall be approved in writing by the appropriate City or State agency and submitted to the Project Manager.

J. Special duty police officers shall be provided for traffic control. Only special duty police officers shall control/direct traffic at intersections.

K. The Contractor shall notify the following offices 30 days prior to the implementation of any detours, and inform them of the location, scope of work, proposed closures of any streets or traffic lanes, the need to detour any bus routes or the need to relocate bus stops:

DTS-PTD: 808-768-8396 and TheBusStop@honolulu.gov
O‘ahu Transit Services (OTS):
Bus Operations – 808-768-9520 and 808-848-4565 and
Field_Operation_Mgr@honolulu.org
Para-Transit Operations: 808-454-5006 and 808-454-5083

L. As requested by the Project Manager, the Contractor shall give two (2) weeks advance notice to the Police Department, Fire Department, ambulance services (i.e., City, State, private), Refuse Division, and any public transit or public utility

company of any work that may affect their operations, including any road closures.

M. Two (2) weeks prior to construction, the Contractor shall notify residents and/or businesses adjacent to that work zone of any road closures or detours that shall be occurring. The Contractor shall submit the notice to the Project Manager for review and approval of the notice prior to distributing the notification to the residents and businesses.

N. During periods where work zones are fronting driveways, The Contractor shall be responsible for maintaining access with minimal delay to the resident(s) during the work day.

O. During periods where work zones occur within pedestrian areas, The Contractor shall be responsible for providing a safe pedestrian path through the work zone, unless otherwise accounted for within the approved Traffic Control Plans.

P. All excavations shall be covered during non-working hours with a safe, non-slip surface.

Q. Warning signs of adequate size and wording shall be located and installed as directed by the City Department of Planning & Permitting – Traffic Review Branch and the Contractor shall abide by other directives which may be issued by the Department of Planning & Permitting to eliminate other traffic problems and hazards.

R. If an active traffic lane other than those shown on the traffic control plans cannot be provided, and the road must be closed, the Contractor shall submit a traffic control plan to the City Department of Transportation Services and/or Department of Planning and Permitting – Traffic Review Branch for approval at least three weeks prior to closing off the road.

S. The Contractor shall submit a weekly schedule by noon the Thursday prior for distribution to the media via the Department of Hawaiian Home Lands. The weekly schedule shall include the street addresses that will be affected by the upcoming work. Failure to meet this deadline may require the Contractor at his cost to publish a "Notice to Motorists" in the local paper at the discretionary direction of the Project Manager.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01410 – PERMITS AND LICENSES

This Section shall supplement Section 7.4, "Permits and Licenses" of the DHHL CONSTRUCTION GENERAL CONDITIONS, as well as SC-17, "NPDES Permits" of the SPECIAL CONDITIONS.

PART 1 – GENERAL

The Contractor shall consult with all appropriate governmental agencies to determine the applicable permits, charges, and fees required for the Project. Unless otherwise specified in the Contract, two (2) copies of all permits required for the Project shall be submitted to the Project Manager.

Permits, charges, and fees required for the Project may include, but not be limited to the following:

A. Sidewalk and Driveway Permit
B. Trenching Permit
C. Street Usage Permits (City and/or State)
D. Fire Hydrant Usage Permit
E. Community Noise Control Permit
F. Dumping Charges
G. Permit to Discharge Effluent into the City and County Separate Storm Sewer System
H. Permit to Discharge Effluent into State Drainage System
I. Chapter 55 Water Pollution Control, Hawai‘i Administrative Rules, Title 11, State Department of Health, permits for discharges of storm water runoff associated with construction
J. Industrial Wastewater Discharge Permit for Temporary Discharges into the City's Sewer System
K. Noise Variance

None of the permits listed above have been obtained by DHHL. The Contractor is responsible for obtaining all permits and clearances that may be required in order to perform the required construction activities based on his/her construction means and methods.

PART 2 – PRODUCTS (not used)

PART 3 – EXECUTION (not used)

END OF SECTION

SECTION 01430 – TEMPORARY WATER POLLUTION, DUST AND EROSION CONTROL

PART 1 - GENERAL

1.01 GENERAL: This section covers temporary water pollution, dust, and erosion controls during construction operations under this contract and for those measures set forth in other sections of the TECHNICAL SPECIFICATIONS. The Contractor shall develop required best management practices (BMPs) and furnish all labor, materials and equipment required for constructing, maintaining and repairing, and removing temporary water pollution, dust, and erosion control measures at the project site, including local material sources and work areas. It is the responsibility of the Contractor to investigate and comply with all applicable Federal, State, and County laws and regulations concerning environmental protection and pollution control, and to secure all necessary permits.

1.02 SUBMITTALS: The Contractor shall submit the following in accordance with provisions as herein specified:

A. Water Pollution, Dust, and Erosion Control Meeting. Submit Site Specific BMP to Project Manager. Schedule a water pollution, dust, and erosion control meeting with Project Manager after site specific BMP is accepted in writing by Project Manager. Meeting shall be scheduled 14 days before start of construction work. Discuss sequence of work, plans, and proposals for water pollution, dust, and erosion control.

B. Water Pollution, Dust, and Erosion Control Submittals:

Submit the following:

1. Written site-specific BMP's describing activities to minimize water pollution and soil erosion into State waters, drainage or sewer systems. BMP's shall include the following:

   a. An identification of potential pollutants and their sources.
   b. An identification of catch basins and inlets/paths to stream channels that may receive construction runoff and pollutants.
   c. List of all materials and heavy equipment to be used during construction.
   d. Descriptions of the methods and devices used to minimize the discharge of pollutants into state waters, drainage or sewer systems.
   e. Details of the procedures used for maintenance and subsequent removal of any erosion or siltation control devices.
   f. Methods of removing and disposing hazardous wastes encountered or generated during construction.
   g. Spill control.

h. Methods of storing and handling of oils, paints and other products used for the project.
i. Material storage and handling areas, and other storage areas.
j. Fueling and maintenance of vehicles and other equipment.
k. Tracking of sediments offsite from project entries and exits.
l. Litter management.
m. Toilet facilities.
n. Other factors that may cause water pollution, dust and erosion control.

2. Provide plans indicating location of water pollution, dust, and erosion control devices. At a minimum, install silt fences or biosocks around disturbed/staging/storage areas, as well as sediment filters at catch basin and drain inlets that are on the path subject to construction runoff. Provide plans and details of BMP's to be installed or utilized; show areas of soil disturbance, indicate areas where vegetative practices are to be implemented, and areas used for the storage of soil or waste. Indicate intended drainage patterns on plans. Include separate drawings for each phase of construction that alters drainage patterns. Indicate approximate date when device will be installed and removed.

3. Construction schedule.

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

C. Follow guidelines in the "Construction Best Management Practices Field Manual" by HDOT dated January 2008, and the "Storm Water Best Management Practice Manual for Construction" by C&CH dated November 2011, in developing, installing, and maintaining BMPs for all projects. Follow the C&CH DPP's "Rules Relating to Water Quality of the Administrative Rules, Title 20" for all projects on O'ahu.

D. Date and sign BMP. Keep accepted copy on site throughout duration of the project. Revisions to the BMP shall be included with original BMP's. Modify contract documents to conform to revisions. Include ACTUAL DATE OF INSTALLATION AND REMOVAL OF BMP'S. OBTAIN WRITTEN ACCEPTANCE BY PROJECT MANAGER BEFORE REVISING BMP'S.

1.03 IMPLEMENTATION: After receipt of Notice to Proceed, the Contractor shall submit in writing the above site-specific BMP's for approval of the Project Manager within 5 days after Notice to Proceed. Approval of the Contractor's plan will not relieve the Contractor

of his responsibility for adequate and continuing control of pollutants and other environmental protection measures.

1.04 SUBCONTRACTORS: Compliance with BMP's by subcontractors shall be the responsibility of the Contractor.

1.05 NOTIFICATION: The Project Manager will notify the Contractor in writing of any observed noncompliance with the aforementioned Federal, State, or local laws or regulations, permits, and other elements of the Contractor's site-specific BMP. The Contractor shall, after receipt of such notice, inform the Project Manager of proposed corrective action and take such action as may be approved. If the Contractor fails to comply promptly, the Project Manager may issue an order stopping all or part of the work until satisfactory corrective action is taken. No time extensions shall be granted or costs or damages allowed to the Contractor for any such suspension.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 WATER POLLUTION CONSTRUCTION REQUIREMENTS:

Do not begin work until submittals detailed in Subsection 1.02, Submittals, are completed and accepted in writing by Project Manager.

Install, maintain, monitor, repair, and replace site-specific BMP measures, such as for water pollution, dust, and erosion control.

Address all comments received from Project Manager.

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

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

Do not expose or disturb surface area of earth material (including clearing and grubbing) until BMP measures are installed and accepted in writing by the Project Manager. BMP measures shall be in place and operational at the end of workday.

Clean up and remove any pollutant that can be attributed to the Contractor.

Install or modify BMP measures due to change in the Contractor's means and methods, or for omitted conditions that should have been allowed for in the accepted site-specific BMP or a BMP that replaces an accepted site-specific BMP that is not satisfactorily performing.

Properly maintain all BMP features. Inspect, remove debris collected, prepare a written report, and make necessary repairs to BMP measures at the following intervals:

A. Weekly during dry periods.

B. Within 24 hours of any rainfall of 0.25 inch or greater which occurs in a 24-hour period.

C. Daily during periods of prolonged rainfall.

D. When existing erosion control measures are damaged or not operating properly as required by site specific BMP measures.

E. Temporary removal of construction BMPs that may affect drainage or cause a potential flooding hazard in the event of a weather advisory warning.

Remove any BMP measures that may result in potential danger or damage to project or public due to potential or actual flooding caused by those BMP measures.

Maintain records of inspections of BMP work. Keep continuous records for duration of the project. Submit weekly copy of records to Project Manager.

In addition to weekly reports, submit to Project Manager all amounts spent initializing and maintaining BMP measures during previous week. Amount spent includes, but is not limited to: purchases of erosion control material, construction of storage areas, and installation of water pollution, erosion, and dust control measures. Submit report weekly along with site inspection report.

Protect finished and previously seeded areas from damage and from spillover materials placed in upper lifts of embankment.

When there are conflicts between these requirements and laws, rules, or regulations of other Federal or State local agencies, the more restrictive laws, rules, or regulations shall apply.

Non-Compliance: The Project Manager will notify the Contractor of any non-compliance with the foregoing provisions and the action to be taken. If the Contractor fails or refuses to comply promptly, the Project Manager may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No extension of time or payment for excess costs or damages shall be made for the time lost due to such interrupted action.

The Contractor's designated representative specified in Subsection 1.02.B.4 shall address any BMP measure concerns brought up by Project Manager within 24 hours of notification, including weekends and holidays. Project Manager may use his/her own labor forces to provide necessary corrective measures shall the Contractor fail to satisfactorily address those concerns. Project Manager will charge Contractor such incurred costs plus any associated Project Management costs. Project Manager will make appropriate deductions from Contractor's monthly progress estimate. Failure to apply BMP measures shall result in either or both the establishment and increase in the amount

of retainage due to unsatisfactory progress or withholding of monthly progress payment. Continued failure to apply BMP measures may result in one or more of the following: assessment of liquidated damages, suspension, or cancellation of Contract with the Contractor being fully responsible for all additional costs incurred by the State.

3.02 DUST CONTROL CONSTRUCTION REQUIREMENTS

A. For the duration of the contract, the Contractor, at his/her own expense, shall keep the project area and the surrounding areas free from dust that would cause a hazard or nuisance to the work or the operations of other contractors or to persons or property. The work shall be in conformance with the Air Pollution Control Standards and the Regulations of the State Department of Health. Contractor shall construct dust fences as designated on plan, and submit dust fence assembly and materials used. Approved temporary methods of stabilization consisting of sprinkling or similar methods may be permitted to control dust. If approved, sprinkling must be repeated at such intervals as to keep all parts of the disturbed area at least damp at all times, and the Contractor must have sufficient competent equipment on the job to accomplish this if sprinkling is used. Chemicals or oil treating shall not be used.

B. Control dust as the work proceeds and whenever a dust nuisance or hazard occurs. Controls shall be maintained from the start of construction until completion of the project, or as directed by the Project Manager. No separate or direct payment will be made for dust control and the cost thereof shall be considered incidental to and shall be included in the Contract price.

C. The Contractor shall construct dust screens around all non-granular stockpile materials and spoil materials.

END OF SECTION

SECTION 01500 – MAINTAINING THE EXISTING WASTEWATER SYSTEM

PART 1 - GENERAL

1.01 GENERAL: The existing wastewater system and facilities shall be maintained in full operation at all times. When the existing wastewater system is affected by the Contractor's performance of the Contract, the Contractor shall provide adequate provisions to ensure that sewage flow through the existing system and facilities is maintained without spillage.

1.02 RELATED SECTIONS

Section 01410	Permits and Licenses
Section 01518	Environmental Pollution Control
Section 02731	Sewer Flow Control

1.03 SUBMITTALS: Wastewater Spill Mitigation Plan shall be submitted by the Contractor to the Project Manager for review within 60 days after the NTP and approved 30 days prior to the planned start of actual flow bypass activities. The Wastewater Spill Mitigation Plan shall detail the procedures and provisions that the Contractor will implement to ensure uninterrupted sewage flow throughout the Project and, should a spill occur, regulatory agencies' requirements are satisfied. Any revisions to the plan requested by the above agencies prior to approval shall be the responsibility of the Contractor. No construction activities involving the existing wastewater system and facilities will be allowed until the Contractor's Wastewater Spill Mitigation Plan has been approved.

The Contractor's Wastewater Spill Mitigation Plan, at minimum, shall include:

A. The Contractor's sewage diversion and bypass pumping plan which has been approved by the Project Manager before any diversion of sewage flows has started.

B. Specific details of all work which will affect the existing wastewater facilities.

C. A project schedule indicating when work affecting the existing wastewater facilities will occur.

D. Spill prevention, mitigation, containment, treatment, disposal provisions and procedures to be implemented whenever the existing wastewater facilities are affected. Reference SECTION 01518, "Environmental Pollution Control".

E. Reporting requirements which conform with the current edition of Department of Health (DOH) Wastewater Branch's (telephone no. 586-4294) "Protocol for Sewage Spills" and which include immediate coordination with DOH and, if applicable, Division of Environmental Quality of the City Department of Environmental Services (EQ) (telephone no. 768-3279) through the Project

Manager. A January 2002 edition of the "Protocol for Sewage Spills" has been attached hereto as pages 01500-3 through 01500-6 for information only. The Contractor shall obtain a current official copy of the "Protocol for Sewage Spills" from DOH.

F. Acknowledgement of the requirements of SECTION 01410, "Permits and Licenses".

G. Identification of potential liabilities involved with working with the wastewater system, sewage spills, reporting requirements should spills occur, and monitoring requirements of pollutant discharges into receiving waters.

1.04 GENERAL REQUIREMENTS: The Contractor shall be liable for any fines and damages relating to sewage spills or the failure to maintain normal sewage flows in the existing wastewater system. The Contractor shall be responsible for coordination of his/her work with the Project Manager to ensure that his/her intended work procedures will be compatible with the design and operation of the existing wastewater system and the new wastewater improvements being constructed under this contract.

The Contractor shall be responsible for any damages to the existing wastewater system and facilities caused by his/her construction activities. This includes, but is not limited to, existing sewer lines, manholes, and other improvements.

The Contractor shall be responsible for all costs to return all facilities and property back to its original working conditions. This includes, but is not limited to, restoring or replacing all materials, equipment, property, or improvements damaged or disturbed as a result of the Contractor's activities.

The Contractor shall keep all existing sewer manholes and sewer lines accessible to maintenance crews at all times. Temporary barricades, steel plating, and other provisions shall be installed as required to allow emergency access to these existing sewer facilities at all times.

Payment for all costs and work performed under this section shall not be made directly but shall be considered incidental and included in the prices bid for the various items of work.

Payment for sewer flow control shall include temporary bypass piping and pumps, controls, stand-by equipment, placement, burying (where required) and removal of bypass lines and site restoration as required, plugs, and all appurtenances needed to complete the work (Excluding special-duty police officer/flagman, excavation, backfill and pavement restoration). Reference SECTION 02731, "Sewer Flow Control" for more details.

Protocol for Sewage Spills (Revised January 2002) follows on pages 01500-3 through 01500-6:

PROTOCOL FOR SEWAGE SPILLS
(Revised **January 2002**)

Spills to Surface Waters

1. The County or Federal agency shall immediately notify the Chief of the Clean Water Branch (808-586-4309) on all spills into State Waters.

   If a spill occurs on the neighbor islands, the County or Federal agency shall immediately notify the Environmental Health Program (EHP) chief or their representatives:

   Kauai District Health Office (DHO) (808-241-3323);
   Maui DHO (808-984-8234, 808-984-8200); or
   Hawai‘i DHO (808-974-6006)

   During non-working hours contact the:

   Call the State Hospital Operator (24 hrs.) at 808-247-2191. The next working day notify the Clean Water Branch and the respective district EHP chief with a follow-up call.

2. As part of the requirement, the County or Federal agency shall immediately send out a press release for spills over a thousand gallons and for lesser spills if they present a substantial threat to public health. The press release shall describe the location of the spill, the amount of sewage released, what caused the spill, and what is being done to rectify the situation. Also, include a contact person and telephone number (including an after hours/weekend contact). Fax or telephone the press releases to the following:

   * Associated Press (for radio dissemination) (Phone No. 808-536-5510)
   * Major statewide and island newspapers
   * Major television news stations
   * Department of Health (Fax No. 808-586-4444)

   For neighbor island spills also include your respective island EHP chiefs:

   Kauai DHO (Fax No. 808-241-3566)
   Maui DHO (Fax No. 808-984-8222)
   Hawai‘i DHO (Fax No. 808-974-6000)

3. Sewage that is spilled into near shore waters shall be disinfected prior to being discharged if sufficient disinfection contact time is available. Best judgment should be used in determining the amount of chlorine added to the discharge if chlorine is used as a disinfectant.

4. The County or Federal agency shall immediately post "Warning Signs" in the areas likely to be impacted by the spill and where public access is possible.

5. The DOH shall also assure that sufficient number and location of the "Warning Signs" have been posted. Authorization to remove the signs will also come from the DOH.

6. The County or Federal agency shall conduct bacteria (enterococci and either clostridium perfringens or fecal coliform) sampling of spills greater than 100 gallons, or when public health may be threatened in the area in the receiving water affected by the discharge as soon as possible. The results shall be submitted to the DOH immediately. Monitoring shall continue until notification to stop is received from the DOH.

7. The DOH shall be informed of the sampling stations and may modify the number of stations and site selection.

8. The DOH may require additional bacteria monitoring by the County or Federal agency to supplement their existing monitoring program, as may be necessary or appropriate. The DOH may also require the County or Federal agency to post additional "Warning Signs" as needed and may assist in removal of the signs.

9. The County or Federal agency shall submit a written report of the details of the spill within five (5) calendar days of the incident to the Director of Health. The report shall include the cause of the incident, clean-up efforts, remedial actions to prevent future incidents, a summary of the sampling data, a map of the sampling locations and public notification procedures if applicable.

<u>Spills Not Reaching Surface Waters</u>

Spills within the Confines of a Wastewater Facility (where public access is restricted):

1. Immediate reporting of minor spills (less than 1,000 gallons **but greater than 50 gallons**) within the confines or fence line of a wastewater facility is not required but should be recorded by operating personnel. Spill records are to be tabulated and kept onsite for review by DOH personnel.

2. Major (greater than 1,000 gallons) or chronic (**occurring more than twice within a 12 month period**) spills within the confines or fence line of a wastewater facility shall be immediately reported to the Chief of the Wastewater Branch (808-586-4294). The County or Federal agency shall submit a written report of the details of the spill within five (5) calendar days of the incident to the Director of Health. The report shall include the cause of the incident, clean-up efforts, and remedial actions to prevent future incidents.

Spills Outside of the Confines of a Wastewater Facility:

1. The County or Federal agency shall immediately notify the Chief of the Wastewater Branch (808-586-4294) of all spills greater than a thousand gallons that have not entered State Waters.

   If a spill that is greater than a thousand gallons occurs on the neighbor islands, the County or Federal agency shall immediately notify the Environmental Health Program chiefs or their representatives:

   Kauai DHO (808-241-3323);
   Maui DHO (808-984-8234, 808-984-8200); or
   Hawai‘i DHO (8080974-6006).

   During non-working hours contact the:

   Call the State Hospital Operator (24 hrs.) at 808-247-2191. The next working day notify the Wastewater Branch or on the neighbor islands, the respective district EHP chief with a follow-up call.

2. As part of the requirement, the County or Federal agency shall immediately send out a press release for spills over a thousand gallons and for lesser spills if they present a substantial threat to public health. The press release shall describe the location of the spill the amount of sewage released, what caused the spill, and what is being done to rectify the situation. Also, include a contact person and telephone number (including an after hours/weekend contact). Fax or telephone the press releases to the following:

   * Associated Press (for radio dissemination) (Phone No. 808-536-5510)
   * Major statewide and island newspapers
   * Major television news stations
   * Department of Health (Fax No. 808-586-4444)

   For neighbor island spills also include your respective island DHOs:

   Kauai DHO (Fax No. 808-241-3566)
   Maui DHO (Fax No. 808-984-8200)
   Hawai‘i DHO (Fax No. 808-974-6006)

3. Sewage that is spilled shall be disinfected prior to being discharged if sufficient disinfection contact time is available.

4. The County or Federal agency shall submit a written report of the details of spills greater than a thousand gallons within five (5) calendar days of the incident to the Director of Health. The report shall include the cause of the incident, clean-up efforts, remedial actions to prevent future incidents, and public notification procedures if applicable.

5. The County or Federal agency shall immediately post "Warning Signs" in the vicinity of the discharge area where public access is possible. All spill sites shall be cleared of all debris and standing wastewater, and disinfected. Areas containing standing wastewater which cannot be removed shall be limited to public access by having the area roped off or limited by other means.

6. For spills less than a thousand gallons immediate reporting is not required. A tabulated summary of spills less than a thousand gallons shall be submitted quarterly to DOH.

7. Reporting of leaks or breaks in pipelines discovered during inflow/infiltration repair work is not required. These situations are considered exfiltration.

Contractor shall notify Construction Manager of all spills. Construction Manager will inform the appropriate parties/agencies.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01505 – PRIOR NOTICE OF REMOVAL OF SURFACE ENCROACHMENT

PART 1 - GENERAL

The Contractor may identify surface encroachments within the public right-of-ways and sewer easements during preconstruction survey per SC-18, DOCUMENTATION OF EXISTING IMPROVEMENTS, and during construction. The Contractor shall notify the Project Manager immediately for the encroachments that may affect the completion of this project. The Project Manager shall notify DHHL for approved actions.

Whenever requiring a permanent removal of surface encroachments (i.e. privately owned improvements, structures, plants, and shrubbery) from the public right-of-ways and sewer easements, the Contractor shall notify the affected owners of the impending action. Written notice shall be given at least 60 days in advance of commencement of such removal to the affected owners of impending action. The notice shall identify to each affected owner the specific encroachment to be removed, the precise location of the encroachment within the owner's property, the extent of encroachment into the public right-of-ways or sewer easements, the extent of removal (i.e. complete removal, trimming of branches or roots), and the date that the removal work will commence. Draft copies of the notices shall be approved by the Project Manager sufficiently ahead of time (21 days minimum) to meet the deadlines for issuance of final notices. Copies of final notices shall be submitted to the Project Manager concurrently with issuance to owners.

Unless otherwise directed by the Project Manager, the disturbed area shall be replanted with grass matching the surrounding area if such grass exists within five feet of the disturbed area.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01510 – EXISTING UTILITIES

PART 1 - GENERAL

1.01 DESCRIPTION

This section shall supplement Section 7.36, "Work of and Charges by Utilities" of the DHHL CONSTRUCTION GENERAL CONDITIONS.

1.02 GENERAL

A. The Contractor shall be responsible for maintaining all existing utilities and services in full operation at all times during construction to the satisfaction of the Project Manager. Such utilities and services shall include but not be limited to sewer, water, drainage, electrical, gas, telephone, cable television, fuel, fire alarm cable, and communication utilities and services.

B. The Contractor shall be responsible for the protection of existing surface and subsurface utilities, poles, improvements, structures and facilities within and abutting the project site, trench excavations, borrow sites, and other work areas. Any utilities that the Contractor encounters during the progress of the work, such as telephone lines and ducts, electric lines and ducts, water lines, sewer lines, gas lines, drainage pipes, cable television lines, overhead utility lines, fuel lines, fire alarm cables, and communications lines and ducts, whether or not shown on the plans, shall not be disturbed or damaged unless otherwise instructed in the plans and specifications. The Contractor shall notify the Project Manager, the affected residents and the affected utility company immediately of any damaged or disturbed utility. The Contractor shall also coordinate any temporary utility services with the proper utility companies. The Contractor shall pay all utility installation charges and fees to any utility company for any temporary utility connections.

C. When the trench excavation is adjacent to, above, or beneath existing surface and subsurface utilities, poles, improvements, structures or facilities, the Contractor shall be responsible for properly sheeting and bracing the excavation to prevent slides, cave-ins and settlements, and for protecting and providing support to the existing surface and subsurface utilities, poles, improvements, structures or facilities with beams, struts or underpinnings as required to ensure that no movement or damages occur.

1.03 LOCATIONS

A. All underground pipes, cables, or duct lines known to exist by the DHHL from the search of records are indicated in the Construction Documents. The Contractor shall verify the locations and depths of the facilities and exercise proper care in excavating in the area.

B. Whether or not existing underground and surface improvements are shown on the plans, the Contractor shall make an independent check of the ground prior to the start of construction to ascertain the existence and the exact location of all utility facilities. All existing utility facilities and improvements shall be protected from damage, and if damaged shall be repaired by the Contractor at his/her own expense.

C. Wherever connections of new utilities to existing utilities are shown on the plans, the Contractor shall expose the existing lines at the proposed connection to verify their locations and depths prior to excavation for new lines.

1.04 PROTECTION

All existing utilities to remain in use, whether or not shown on the plans, shall be protected at all times by the Contractor during construction unless specified on the plans to be abandoned. The Contractor shall not interrupt the service function or disturb the support of any utility, such as the base and thrust blocks, without approval of the Project Manager. All valves, switches, vaults and meters shall be maintained readily accessible for emergency shut off.

1.05 RELOCATION

A. When temporary and permanent relocations of existing BWS, HECO, Spectrum, Hawaiian Telcom, Hawaii Gas, or other utilities are required because they pose conflicts with the installation of the proposed Project improvements:

i. The Contractor shall be responsible for notifying and arranging for the respective utility company to perform the actual relocation of the utility, for properly coordinating the work, and for directly reimbursing the utility company for its costs.

ii. The Contractor shall be responsible for performing all other necessary work, including but not limited to, excavation, backfilling, and surface restoration required to complete the relocation of the utility as agreed with the respective utility, and to the design standards of the utility.

iii. For the BWS, the Contractor shall be responsible for directly performing all of the work required to complete the required installation and relocation work, including any supplemental design work that may be necessary. All work shall be coordinated with BWS and shall be performed in accordance with BWS standards and regulations.

iv. For HECO, Spectrum, and Hawaiian Telcom, the Contractor shall be responsible for constructing and performing any required supplemental design work for all utility structures, including but not being limited to underground duct lines and manholes/handholes to the design standards of

the utility.

v. If the underground utility is privately owned, the Contractor shall perform all necessary work to the design standards approved by the Project Manager.

B. For all temporary and permanent relocations of existing BWS, HECO, Spectrum, Hawaiian Telcom, Hawaii Gas, and other utilities for the Contractor's convenience, the Contractor shall be responsible for all arrangements and work detailed hereinbefore in this section titled RELOCATION.

1.06 HAWAIIAN ELECTRIC COMPANY (HECO) FACILITIES

The project site has or will be near existing HECO underground and overhead facilities which would remain energized during construction, the Contractor's attention is directed to the following conditions:

A. The location of HECO's underground facilities shown on the plans are from existing records with varying degrees of accuracy and are not guaranteed as shown. The Contractor shall coordinate all work closely with HECO and shall exercise extreme caution whenever construction crosses or is in close proximity to HECO's underground lines. Adequate clearances shall be maintained when operating equipment near the underground lines.

B. The Contractor shall comply with the State of Hawai'i's Occupational Safety and Health Law (HIOSH).

C. When trench excavation is adjacent to, above, or beneath existing HECO surface or subsurface utilities, ducts, poles, structures or facilities, the Contractor shall be responsible for properly sheeting and bracing the excavation to prevent slides, cave-ins, and settlements, and for protecting and providing support to the existing surface or subsurface utilities, ducts, poles, structures, or facilities with beams, struts, or underpinning as required to ensure that no movement or damages occur to such improvements.

D. For pole bracing instructions, the Contractor shall call the HECO Customer Installation Division 808-543-7070, a minimum of two (2) weeks in advance.

E. Should it become necessary, any work required to relocate HECO facilities shall be done by HECO. The Contractor shall be responsible for all coordination and costs if applicable.

F. The Contractor shall be liable for any damages to HECO's facilities. The Contractor shall report any damages to HECO's facilities to the HECO Trouble Dispatcher at 1-855-304-1212.

1.07 HAWAIIAN TELCOM AND SANDWICH ISLES COMMUNICATIONS LINES

Since the project site is located near existing Hawaiian Telcom or Sandwich Isles Communications underground lines and facilities or overhead lines that will remain energized during construction, the Contractor's attention is directed to the following conditions:

A. The location of underground lines, underground facilities, poles, and overhead lines shown on the plans are from existing records with varying degrees of accuracy and are not guaranteed as shown. The Contractor shall exercise extreme caution whenever construction crosses or is in the proximity of Hawaiian Telcom underground and overhead lines. Adequate clearances shall be maintained when operating equipment near the overhead lines.

B. The Contractor shall comply with the State of Hawai'i's Occupational Safety and Health Law (HIOSH).

C. When trench excavation is adjacent to, or beneath existing surface or subsurface utilities, ducts, poles, overhead lines, structures or facilities, the Contractor shall be responsible for properly sheeting and bracing the excavation to prevent slides, cave-ins, and settlements, and for protecting and providing support to the existing surface or subsurface utilities, ducts, poles, overhead lines, structures or facilities with beams, struts, or underpinning as required to ensure that no movement or damages occur to such improvements.

D. For pole bracing instructions, the Contractor shall call Hawaiian Telcom Technical Support 24-hour line at 808-643-6111 and/or Sandwich Isles Communications (SIC) at 808-540-5754, a minimum of two (2) weeks in advance.

E. Should it become necessary, any work required to relocate Hawaiian Telcom poles and overhead lines shall be done by Hawaiian Telcom; the Contractor shall be responsible for all coordination and applicable costs.

F. The Contractor shall be liable for any damages to Hawaiian Telcom's or Sandwich Isles Communications' facilities. The Contractor shall report any damages to Hawaiian Telcom's facilities at 808-643-6111 (Hawaiian Telcom Technical Support 24-hour line) or SIC facilities at 808-540-5754.

1.08 BOARD OF WATER SUPPLY

A. The Honolulu BWS's "WATER SYSTEM STANDARDS" dated 2002 and the "WATER SYSTEM EXTERNAL CORROSION CONTROL STANDARDS", Volume 3, dated 1991, and all subsequent amendments and additions, shall apply to any water main construction that may be necessary for this project. Should a discrepancy exist between the Standards and these specifications, the latter shall

govern.

B. The Contractor shall notify the BWS and the Project Manager in writing one week prior to commencing work on the water system if such work becomes necessary.

C. The Contractor shall notify the BWS of any damage to the existing mains, and the Board of Water Supply will perform the necessary repairs. All costs incurred in this work shall be paid for by the Contractor.

1.09 COORDINATION WITH UTILITY AGENCIES AND OTHERS

Whenever the trench work crosses or is in close proximity to underground utilities, or if for other reasons during the course of the work it becomes necessary to relocate existing utilities, the Contractor shall notify the Utility Notification Center, which serves as the One-Call Center for Hawai‘i. In addition, the Contractor shall notify and coordinate his/her operations with the respective agencies affected.

The One-Call Center provides advanced warning to excavators of the location of subsurface installations in the area of an excavation for the purpose of protecting those installations from damage. The phone number to request location of underground utilities is (866) 423-7287. To submit a request via the internet visit www.digsafelyhawaii.com. The website includes what information needs to be submitted by the Contractor prior to excavation and a downloadable Locate Request Form. It also contains a link to Hawai‘i Revised Stature HRS Chapter 269E “One Call Center Advance Warning to Excavators”.

UTILITY	AGENCY	TELEPHONE
Communication Lines:		
CATV	Spectrum	808-643-2100
Fiber Optics	AT&T	808-455-1010
	Sandwich Isles Communications	808-540-5748
Overhead/Underground	Hawaiian Telcom	808-643-6111
City and County Lines:		
Fiber Optics	Dept. of Transportation Services (DTS)	808-768-8387
Street Lights	DDC	808-768-8430
Traffic Signals	DTS	808-768-8387
Water Lines	Board of Water Supply	808-748-5000
Other Utility Lines:		
Gas	Hawaii Gas	808-535-5933
Electric	Hawaiian Electric Company (HECO)	808-543-7070

The Contractor shall coordinate with utility companies and agencies prior to working on any construction that will affect their underground and aboveground utilities.

1.10 DELAYS

A. The Contractor shall notify the Project Manager of its construction schedule insofar as it affects the protection, removal or relocation of utilities. Said notification shall be in writing and shall be included as a part of the construction schedule required in Section 7.22 “Construction Schedule” of the DHHL CONSTRUCTION GENERAL CONDITIONS. The Contractor shall notify the Project Manager in writing of any subsequent changes in the construction schedule which will affect the time available for protection, removal or relocation of utilities.

B. The Contractor shall be responsible to give proper written notification to the utility companies and government agencies that have utilities in-place and to cooperate with them in any protection, relocation, or readjustment work. Failure of any utility Owner in performing its work due to improper notification or poor coordination by the Contractor, which results in a delay of the Contractor's work, shall not be grounds for requesting an extension of time or damages.

C. The Contractor will not be entitled to damages or additional payment for delays attributable to utility relocations or alterations if correctly located, noted and completed in accordance with this section.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01515 – CONSTRUCTION AREA APPEARANCE

PART 1 - GENERAL

The Contractor shall, throughout the duration of the Project, keep all streets, sidewalks, driveways, public and private properties, baseyards, and staging areas free from debris produced from the Project. The Contractor shall keep the Project work area and all surrounding areas neat and free from dust nuisance. The Project Manager may require supplementary measures as necessary.

Upon completion of each phase of the Project, the Contractor shall immediately remove all excess material and shall thoroughly clean the affected area.

Upon completion of the work, the Contractor shall remove all equipment, signs, and unused materials provided for the work, shall restore the Project site to a neat and clean condition, and shall do all other required cleaning as specified above or as directed by the Project Manager.

Should the Contractor fail to comply with the foregoing provisions, the Project Manager may, with or without notice, perform the cleaning or hire another Contractor to do the cleaning and deduct the cost of such work from any moneys due to the Contractor under this Contract.

PART 2 – PRODUCTS (not used)

PART 3 – EXECUTION (not used)

END OF SECTION

SECTION 01518 – ENVIRONMENTAL POLLUTION CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK: Furnish all labor, material and equipment and perform all work required for the prevention of environmental pollution during, and as the result of construction operations under this Contract.

This Section contains general specifications pertaining to the prevention of environmental pollution to be maintained until completion of the contract and shall become a part of the work of all other Sections as applicable. The requirements of this Section take precedence over conflicting or contradictory provisions of other Sections.

The work in this Section shall include the following:

1. Obtain all permits required by the Department of Health.

2. Provide all air and water quality testing and monitoring work required by the permits during construction.

3. Provide the facilities, equipment, and structural controls for minimizing adverse impacts upon the environment during the construction period.

1.02 DEFINITIONS

A. For the purpose of this specification, Environmental Pollution is defined as the presence of chemical, physical, or biological elements or agents which:

1. Adversely affect human/animal health or welfare.

2. Unfavorably alter ecological balances important to human/animal life.

3. Affect other species of importance to man.

4. Degrade the utility of the environment for its normal daily function, for aesthetic, and for recreational purposes.

B. The control of environmental pollution requires consideration of air, water, and land, and involves noise control, solid waste management, and management of other pollutants.

1.03 RELATED SECTIONS

Section 01430	Temporary Water Pollution, Dust and Erosion Control
Section 01500	Maintaining the Existing Wastewater System
Section 01560	Confined Space Entry
Section 02110	Temporary Soil Erosion Control

1.04 GENERAL REQUIREMENTS

A. Comply with all applicable Federal and State laws, including the latest Hawai‘i Public Health regulations, local laws and regulations concerning pollution control and abatement.

B. The Contractor shall become familiar with the latest requirements of the National Pollutant Discharge Elimination System (NPDES) Permit and all other necessary permits to discharge water to State receiving waters, into storm drainage systems, and into sanitary sewer systems prior to bidding on this project. The Contractor will apply for appropriate NPDES permits required by the State Department of Health (DOH).

C. Notification: The Project Manager will notify the Contractor in writing of any non-compliance with the foregoing provisions and the action to be taken. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose of notification. After receipt of such notice, the Contractor shall immediately take corrective action. If the Contractor fails or refuses to comply promptly, the Project Manager may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the Contractor unless it was later determined that the Contractor was in compliance.

D. Sub-Contractor: Compliance with the provisions of this Section by subcontractors will be the responsibility of the Contractor.

1.05 WASTEWATER DISCHARGES/SPILLS

A. The Contractor shall be liable for any treatment of discharges that is required before disposal and for any fines, clean-up costs, and damages which may occur through the violation of any federal, state, or local law which may be applicable.

B. The Contractor shall be liable for all clean-up costs, fines, and damages resulting from wastewater spills related to any construction activities. The Contractor shall not store chemicals, materials, or equipment at the work site unless specifically authorized by the Project Manager.

C. All sewage spills shall be cleaned up immediately. Every effort shall be made to prevent spills from entering the storm drainage system. After the majority of the sewage from the spill has been removed, the contaminated area(s) shall be disinfected with Triton (manufactured by Zep Inc.), or an approved equal.

D. Within 30 calendar days after the Notice to Proceed date, the Contractor shall prepare a Wastewater Spill Mitigation Plan as specified in SECTION 01500, “Maintaining the Existing Wastewater System”. This plan shall be approved by the Project Manager, prior to commencing construction.

E. The Contractor shall be responsible for any damages to the existing wastewater system and facilities caused by his construction activities. This includes, but is not limited to, existing sewer lines, manholes, treatment processes, and other improvements. The Contractor shall be responsible for all costs to return all sewer facilities and property back to its original working conditions. This includes, but is not limited to, restoring or replacing all materials, equipment, property, or improvements damaged or disturbed as a result of the Contractor's activities.

1.06 ODOR: The Contractor shall ventilate all sewer manholes and pipelines where man entry is required in accordance with Section 01560, "Confined Space Entry". Otherwise, any open sewer manholes or openings in the sewer pipe shall be sealed at all times to minimize dispersal of sewer pipe odor above ground. In cases where an opening cannot be sealed because of concerns for worker safety, the opening shall be vented and filtered before released into the atmosphere.

1.07 NOISE CONTROL

A. The Contractor shall comply with the provisions of Chapter 46, Community Noise Control for O'ahu, of the State Department of Health, Administrative Rules. When required, the Contractor shall obtain a Community Noise Permit. Construction equipment and on-site vehicles or devices requiring an exhaust of gas or air shall have mufflers. The Contractor shall comply with conditional use of the permit as specified in the rules and the conditions issued with the permit. Should there be a baseyard or stockpile area located adjacent to residences, mitigative measures, such as barriers or berms, shall be developed in the event that noise complaints are received.

B. The Contractor shall comply with provisions of Chapter 46, Community Noise Control for O'ahu, of the State Department of Health, Administrative Rules, and with all approval conditions issued with the project's Community Noise Variance for all work activities conducted during the following times:

- Mondays through Fridays: Midnight to 7:00 a.m. and from 6:00 p.m. to Midnight
- Saturdays: Midnight to 9:00 a.m. and from 6:00 p.m. to Midnight
- Sundays and Holidays: Midnight to Midnight

With the exception of the operation of the temporary bypass lines and sewage pumps, construction activities will not be performed during federal and state holidays, and/or special events.

C. Compliance with the provisions of this section by the subcontractors will be the responsibility of the Contractor.

D. The Project Manager will notify the Contractor of any non-compliance with the foregoing provisions and the actions to be taken. If the Contractor fails or refuses to comply promptly, the Contracting Officer, upon the recommendation of the

Project Manager, may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No extension of time or payment for excess costs or damages shall be made for the time lost due to interrupted action.

1.08 LAND RESOURCES PROTECTION

A. General: Unless otherwise indicated on the drawings, existing land resources within the property lines and outside the limits of permanent work performed under this contract shall be preserved in their present condition or be restored to a condition after completion of construction that will appear to be natural and not detract from the appearance of the project. Insofar as possible, confine construction activities to areas defined by the plans or specifications.

B. Restoration of Damage: Restore any trees or other landscape features scarred or damaged by the Contractor's equipment, or operations as nearly as possible to its original condition at the Contractor's expense. The Project Manager will decide what method of restoration shall be used and whether damaged trees or other landscape feature shall be treated and healed or removed from the site and replaced with new features.

C. Post-Construction Clean-Up: Obliterate all signs of temporary construction facilities such as work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, or any other vestiges of construction as directed by the Project Manager. No separate payment will be made for post-construction cleanup or obliteration and all cost thereof shall be considered a portion of the Contract Price, except as otherwise provided for in the Contract Documents.

1.09 HISTORICAL AND ARCHAEOLOGICAL FINDS: All items having any apparent historical or archeological interest discovered in the course of construction activities shall be carefully preserved. Leave the archeological find undisturbed and immediately report the find to the Project Manager and the State Historic Preservation Officers from the State Department of Land and Natural Resources at phone (808) 692-8015 to assess the significance of the find and recommend an appropriate mitigation measure, if necessary.

1.10 BURNING: No materials shall be burned within the contract area at any time within the contract period.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01520 – WORK ON STREETS MAINTAINED BY CITY

PART 1- GENERAL

This section shall supplement Section 7.17, "Protection of Persons and Property" of the DHHL CONSTRUCTION GENERAL CONDITIONS.

DHHL streets within the project area are maintained by the City. All necessary permits and approvals shall be obtained from the City and County of Honolulu Department of Planning and permitting (DPP), Department of Transportation Services (DTS), and Department of Facility Maintenance (DFM), as applicable, before work on any portion of a public street or highway may begin and before any changes to traffic controls are implemented.

For bidding purposes, assume the following normal working hours:

A. For work within public roadway areas, the Contractor may work from 8:30 a.m. to 3:30 p.m., Monday through Friday, except City and State holidays.

B. For work within utility easement areas, the Contractor may work from 8:30 a.m. to 3:30 p.m., Monday through Friday, except City and State holidays. The Contractor may be allowed to extend their work time until 5:00 p.m. if approved by the Project Manager.

Longer hours may be permitted as approved by DTS and the Project Manager. Shorter hours that may be imposed due to traffic problems and concerns beyond the control of the Contractor would be justification for additional costs to be determined in accordance with the provisions of Section 4.2.4, "Change Orders" of the DHHL CONSTRUCTION GENERAL CONDITIONS.

During non-working hours, all trenches shall be covered with a safe non-skid bridging material and all lanes shall be opened to traffic, unless otherwise approved by DTS and the Project Manager. Worn non-skid surfaces that do not provide proper skid resistance shall not be used.

Construction operations extending beyond normal working hours shall minimize disruptions to traffic to the extent possible, and allow for normal traffic flow, unless otherwise approved by DTS and the Project Manager.

Where pedestrian walkways exist, they shall be maintained in passable condition, or other facilities and alternative routes for pedestrians shall be provided. Passage between walkways at intersections shall likewise be provided. All passageways so provided shall be handicap accessible and conform to the requirements of the Americans with Disabilities Act accessibility guidelines.

The Contractor shall reference, to the approval of DTS, all existing traffic signs, posts, and pavement markings prior to the commencement of construction. The Contractor shall replace or repair all traffic signs, posts, and pavement markings disturbed by his/her activities. The Contractor shall notify DTS one (1) week prior to any work to be done on signs, posts, and pavement markings. On City maintained streets, the Department of Facilities Maintenance at

808-768-3644 shall be notified.

Driveways and other access routes to private property shall be kept open unless the owners of the property using these rights-of-ways are satisfactorily provided with other temporary arrangements. The requirements of SECTION 01120, "Access to and Protection of Property" shall apply.

The Contractor shall notify emergency personnel (i.e. the Honolulu Police Department, the Honolulu Fire Department, and the ambulance services) of the construction work in progress and the blocking or complete closure of any street during construction.

The Contractor shall notify the Department of Transportation Service, Public Transit division at 768-8396 and O'ahu Transit Services, Inc. (bus operations: 808-848-4565 or 808-848-4571 and para-transit operations: 808-454-5006 or 808-454-5083) of the scope of work, proposed closure of any street or traffic lanes, sidewalk, or bus stop and duration of project at least 30 days prior to construction.

Existing street lighting shall remain operational during construction. Any relocation required shall be approved by the Mechanical/Electrical Design and Engineering Division and paid for by the Contractor. The Contractor shall be responsible for any damages to existing street lighting facilities and damages shall be repaired by the Contractor at his total cost.

Due to limited parking for businesses and residents in the area, vehicles and equipment that can be readily driven on streets and the highway, shall not be parked on roadways within the project area during non-working hours. Construction materials shall also not be left within the road right-of-way during non-working hours. Roadside parking of other equipment (that cannot be readily driven on streets) during non-working hours that block sidewalks and/or encroach into the road travel-way more than typical vehicles shall be approved as required by the City Department of Planning and Permitting, as applicable, and the Project Manager. The Contractor shall provide barricades and appropriate nighttime safety equipment as required and shall be fully responsible for the consequences of all safety hazards.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01525 – PROTECTION IN SHIPMENT AND STORAGE

PART 1 - GENERAL

This special provision shall supplement Section 6.8 Handling Materials and Section 6.9 Storage of Materials of the DHHL CONSTRUCTION GENERAL CONDITIONS.

1.01 GENERAL

All materials to be installed under the Contract shall be properly prepared and crated for shipment and handled during shipment and storage to prevent damage. The materials shall be properly stored, handled, and protected per manufacturer's requirements and recommendations during all phases of construction until final acceptance of the Project and such material by DHHL. Protective coatings and wrappings shall be removed and cleaned from the materials immediately prior to painting or final inspection.

The Contractor shall assume sole responsibility for all defects, losses, damages, and theft of any material until final acceptance of the Project.

The DHHL personnel or its representatives will not accept deliveries of materials for the Contractor.

The above requirements shall apply to all materials provided for the Project.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01530 – STAGING, ADDITIONAL WORK AND ACCESS AREAS

PART 1 - GENERAL

The Contractor should be responsible to obtain staging areas for his construction activities. Per State Historic Preservation Division (SHPD), Department of Land and Natural Resources, a staging area should be included as part of the ground disturbing area. The staging areas are part of the area of potential effects (APE) in the Section 106 consultation process to assess adverse effects onto historic properties located within or near APE. The staging areas shall be assessed by the Contractor for APE to avoid adverse impacts to historic features including but not being limited to cemeteries, rock walls, bridges, basalt curbstones and other sensitive historic sites that have been identified.

To facilitate construction of the project, a vacant DHHL parcel (TMK 85029019) at 85-1091 Kaneaki Street, adjacent to the project site, is available for construction staging and field office. The Contractor shall obtain the required agreements from DHHL to use this lot during construction. Contractor shall be responsible to follow the terms and conditions of using staging areas, restore the existing ground areas within the staging area limits, work sites, and adjacent work sites to their original condition.

No additional staging areas or contract time on the contract shall be granted. The Contractor shall be responsible for negotiating, acquiring, and paying compensation for all additional work and access areas that he feels may be necessary to perform the Contract. Written consent-to-enter agreements with property owners shall be required for each work or access area arranged by the Contractor and shall contain all terms of the agreement and the signatures of all parties involved unless otherwise allowed by the Project Manager. The Contractor shall be solely responsible for the compliance of all involved parties with the terms of the agreement and for any legal conflict resolution that may be required between the parties. Two (2) copies of each such agreement shall be submitted to the Project Manager within seven (7) calendar days of consummation of the agreement. Use of the additional work and access areas acquired by the Contractor in a private property will not be permitted until the consent-to-enter agreement has been submitted to the Project Manager. By submitting this bid, the Contractor acknowledges that he has sufficient staging area to complete the project.

The requirements of the SECTION 01430, “Temporary Water Pollution, Dust and Erosion Control”, SECTION 01518, “Environmental Pollution Control”, SECTION 02110, “Temporary Soil Erosion Control”, and SECTION 02950, “Restoration of Property” shall fully apply unless other requirements have been negotiated between the property owners and the Contractor and included in the written consent-to-enter agreements.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01540 – FIELD OFFICE AND UTILITY SERVICES

PART 1- GENERAL

This section shall supplement SC-27, “Field Office” of the DHHL SPECIAL CONDITIONS.

1.01 GENERAL

The Contractor shall provide a field office and its utility services with 24-hour per day access for the exclusive use and entry of the Construction Manager or their representatives, as well as DHHL representatives, at a location approved by the Project Manager within, or in close proximity to, the Project limits.

1.02 EQUIPMENT

Four (4) 34" flat panel LCD or LED monitors, and one (1) professional-grade, high duty cycle, toner cartridge-type, multifunction, color copier / scanner / printer with local area network interface, automatic document feeder and double-sided printing and scanning capability that can handle page sizes up to 12x18 inches. Replacement toner cartridges, scanning drums, and any other consumable or replaceable component (other than paper), as well as on-site professional maintenance and repair service shall be provided by the Contractor for the duration of the contract. All equipment provided shall be like new.

1.03 UTILITY SERVICES

The Contractor shall make his own arrangements for all high-speed internet, electrical, and water services required for the performance of the Contract and shall be responsible for all costs for arranging and utilizing such services. The cost of the work under this section shall not be paid for directly, but shall be included in the prices bid for the various items of work.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01560 – CONFINED SPACE ENTRY

PART 1 – GENERAL

1.01 CONFINED SPACE

For entry into a permit required confined space as defined in 29 CFR Part 1910.146(b), the Contractor shall be responsible for providing:

A. All safety equipment required by the confined space regulations applicable to all parties other than the construction industry to include, but not limited to the following:

(1) Full body harnesses for up to two (2) personnel.

(2) Lifeline and associated clips.

(3) Ingress/egress and fall protection equipment.

(4) Two-way radios (walkie-talkies) if out of line-of-sight.

(5) Emergency (escape) respirator (10-minute duration).

(6) Cellular telephone to call for emergency assistance.

(7) Continuous gas monitoring instrument (calibrated) to measure oxygen content, and concentrations of hydrogen sulfide, carbon monoxide and flammable gases (capable of monitoring at a distance of at least 20 feet away).

(8) Personal multi-gas detector to be carried by inspector.

(9) Signed permit to enter confined space area.

B. Continuous forced air ventilation adequate to provide safe entry conditions.

C. One attendant/rescue personnel topside (two, if conditions warrant it) for each entrant into a confined space.

D. All employees involved in permit space entry must receive training before participating in entry operations.

All safety equipment shall comply with the standards of the Occupational Safety and Health Administration (OSHA) and all applicable Federal, State, and City laws and regulations relating to safety.

1.02 SAFETY AND EXPERIENCE

The Contractor shall have a documented, in-place safety program which meets all Federal and State OSHA regulations, with special emphasis on hazard-free work in confined spaces and sewage environment.

Additionally, the Contractor shall submit documentation of confined space training certification for all personnel performing confined space entry at preconstruction conference.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01610 – ACKNOWLEDGMENT OF LIQUIDATED DAMAGES PROVISION

PART 1- GENERAL

This section shall supplement Section 7.26 of DHHL CONSTRUCTION GENERAL CONDITIONS, and SC-03, Completion Schedule and Liquidated Damages, of the DHHL SPECIAL CONDITIONS for liquidated damages.

It is mutually understood and agreed by and between the parties to the contract that time shall be of the essence for the contract and that in case of failure on the part of the Contractor to complete the work under contract within the time fixed or agreed upon, the DHHL will be damaged thereby, and the amount of said damages, inclusive of expenses for inspection, superintendence, and necessary traveling expenses, being difficult if not impossible of definite ascertainment and proof, it is hereby agreed that the amount of such damages shall be the amount set forth in the Contract as liquidated damages for each and every calendar day, including weekends and holidays, that the Contractor delays in finishing the work beyond the completion deadline established in the contract; and the Contractor hereby agrees to pay the said sum as liquidated damages, and not by the way of penalty, to the DHHL and further authorizes the DHHL to deduct the amount of the damages from monies due the Contractor under the contract, computed as aforesaid. If the monies due the Contractor are insufficient or no monies are due to the Contractor, the Contractor shall pay the DHHL the difference or the entire amount, whichever may be the case, upon demand by the Contracting Officer.

The acknowledgment form attached to and made a part of the bid document shall be completed, signed by the Contractor, and submitted with his bid. Failure to acknowledge and submit the form (see Proposal section) with the bid may be cause for rejection of a bid.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01750 – GUARANTEE

PART 1- GENERAL

This work shall be done in accordance with Section 7.35 - Guarantee of Work of the Interim General Conditions and the criteria listed below.

Any period that a particular installation or part of an installation is not operable due to its failure, shall not be considered as a part of the guarantee period. The guarantee period shall be extended for a like period. Time that equipment is operating shall be counted as applying to the warranty. Such time shall be determined by use of field log or other suitable documentation.

If the Contractor fails to perform corrective work in the manner and within the time stated, the Department of Hawaiian Home Lands (DHHL) may proceed to have such work performed at the Contractor's expense and his sureties will be liable therefore. The DHHL shall be entitled to reasonable attorney's fees and court costs necessarily incurred by the Contractor's refusal to honor and pay such costs of corrective work.

The Contractor's performance bond shall continue in full force and effect during the period of this guarantee.

The rights and remedies of the DHHL under this provision do not preclude the exercise of any other rights or remedies provided by this contract or by law with respect to unsatisfactory work performed by the Contractor.

This guarantee shall be deemed supplemental to guarantee provisions provided in other sections of the specifications for the individual units and systems of units so specified.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01770 - PRE AND POST CONSTRUCTION SURVEYS

PART 1 - GENERAL

This section supplements SC-05, Surveying Services, SC-18, Documentation of Existing Improvements, and SC-21, Pre-Construction/Post-Construction Site Crack and Photo Survey, of DHHL SPECIAL CONDITIONS.

1.01 DESCRIPTION

This Section includes requirements for visual, photographic, and video surveys to document existing site surface conditions and underground utility investigations as required, prior to construction, and surveys to document conditions following construction. These surveys will be used by the DHHL in evaluating any damage to existing facilities resulting from construction activities performed under this Contract.

Payment for pre- and post-construction surveys, including all labor, materials, equipment, and necessary work as required, shall be paid at the lump sum bid for Pre- and Post-Construction Surveys, as scheduled in the Proposal.

1.02 SUBMITTALS

A. Submittals Required After Notice to Proceed

The Contractor shall submit the following in accordance with the requirements of SPECIAL PROVISIONS Section 01300, "Submittal Procedures".

1. Prior to conducting the pre-construction survey, submit a written plan summarizing the procedures to be employed in performing the survey including the personnel and the specific equipment and methods that are proposed.

2. At least two weeks prior to beginning any construction work, submit documentation of pre-construction surveys, including copies of field notebooks, sketches, inspection reports, map showing where photos were taken and location of features documented in the survey, and two CD or DVD copies of annotated photographs and videos.

3. Submit documentation of post-construction surveys, including copies of field notebooks, sketches, inspection reports, map showing where photos were taken and location of features documented in the survey, and two CD or DVD copies of annotated photographs and videos, upon its completion.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 NOTIFICATION

A. Notify the Project Manager at least one week prior to conducting each survey. The Project Manager will accompany the Contractor on both the pre- and post-construction surveys.

B. Notify property owner and residents of the pre- and post-construction surveys at least 30 calendar days prior to conducting each survey.

C. Obtain prior written permission from property owners prior to conducting surveys within non-DHHL right-of-ways. Perform surveys within private properties only if written permission is obtained.

3.02 SURVEYS

A. The Contractor shall perform a pre-construction survey of all areas to be disturbed, including construction excavation, staging and field office areas, as well as the locations where temporary erosion control devices will be installed.

B. The Contractor shall perform a pre-construction survey of all surface features, facilities and improvements which lie within one and one-half (1-1/2) times the depth of excavation, but not less than 25 feet of the sewer alignment centerline, including surface pavement, curb/gutters, sidewalks, driveways, fence/wall, utility boxes and poles, street monuments, fire hydrants, manholes, catch basins, drains, cleanouts, plants/trees, etc.

C. The survey shall involve recording observations in the field notebook, taking photographs, making sketches, and videotaping the buildings and other improvements along the sewer alignment documenting pre-construction conditions.

D. The photographs shall be taken by a digital camera with minimum 10-megapixel resolution. Each photograph shall be marked to indicate the date of photograph and location of the photograph identified on the file name.

E. Video DVDs shall be made of the exteriors of existing buildings and, if pertinent and practicable, the interiors, and other improvements along the sewer alignment showing their general appearance and noting any areas where existing cracks, distress or damage is present.

F. At the completion of construction, post-construction surveys similar to the pre-construction surveys shall be completed to verify the condition of all buildings, pavements, and existing facilities, and note any damage that has occurred.

D. Payment for pre-construction survey will be made upon approval of survey at 50% of the total lump sum bid. The remainder will be paid upon approval of post-construction survey.

3.03 UNDERGROUND UTILITY INVESTIGATIONS

Pre-construction survey also covers all underground utility crossing under or above replacement sewers. The Contractor shall tone or pothole at the crossings of all utilities to locate their locations, and identify any potential horizontal and vertical conflicts prior to trenching. Report to the Project Manager immediately for any utility conflicts or discrepancies.

END OF SECTION

SECTION 01785 – PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

This section supplements SC-05, Surveying Services, and SC-39, As-Built Drawings, of DHHL SPECIAL CONDITIONS and Section 7.31.1, Substantial Completion, of DHHL CONSTRUCTION GENERAL CONDITIONS.

1.01 DEFINITION

A. As-Built Record Documents: Contractor produced to-scale documents representing an accurate drawing record of (as-built) work existing prior to start of any new Work required to be constructed. These drawings are required where as-built conditions differ from Contractor drawn work and where as-built conditions interfere with accomplishing intent of Work.

B. Contract Closeout Record Documents: Contractor produced documents representing an accurate record of Work provided under Contract. Documents include updated Contract Documents with support data and Operation & Maintenance Manuals.

1.02 SUBMITTALS

A. As-Built Record Documents: Prior to acceptance of the work, the Contractor shall furnish the Project Manager with one (1) Auto Cad compatible set and two (2) sets of "As-Built" drawing sets of the gravity sewer line installation and other utilities being relocated for the gravity sewer line installation, accurately drawn to scale, with all items (including, but not limited to laterals) identified by name and symbol, all inverts indicated, and including any other information required by the Project Manager. The work shall not be accepted until the "As-Built" drawings have been approved by the Project Manager. The Contractor shall be responsible for all revisions to the "As-Built" drawings required by the Project Manager prior to approval. The Project Manager may hold a payment application until the "As-Built" drawings are updated and approved.

B. Contract Closeout Record Documents:

1. Contract Documents: Submit one (1) hardcopy and 2 CDs with all of the following, except as otherwise indicated.
    a. Updated Contract Drawings.
    b. Updated Project Manual.
    c. Other drawn and written support data for Drawings and Project Manual necessary to show record of Work.
2. Certification: On transmittal or separate written document, certify that information provided is complete and accurate. Signature document by Contractor.

3. Distribution: DHHL's Representative, DHHL.

C. Quality Assurance Submittals: Submit in accordance with "Quality Assurance" paragraphs herein.

1.03 QUALITY ASSURANCE

A. Contract Closeout Record Documents:

1. Up-to-Date Records: Maintain up-to-date documents during Contract Period. Record data not less than ten (10) working days after installation of each specific portion of Work requiring recording, except record data prior to any concealment of the Work.

2. Availability: Documents are to be made available to Engineer at any time for his review. Timely recording of information and accuracy of recorded information is responsibility of Contractor; whether or not reviewed by Engineer.

3. Out-of-Date Records: If in the opinion of the Engineer, records are not being timely recorded by Contractor, DHHL reserves the right to hire a professional third party service in which to input the required data. If such service is required, Contractor to cooperate with third party service as necessary for third party service to properly and in timely manner record required data. Contractor to pay for all costs associated with securing and maintaining such service for period such service is required.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 MAINTENANCE OF DOCUMENTS

A. Storage: Store documents on or in equipment designed for filing and storage of such documents, including rack and filing cabinets. Locate Contract Documents used for Contract Closeout Record Documents in fire resistant cabinet.

B. Handling: Maintain documents in clean, dry and undamaged condition. Use documents only as necessary to record required information. Do not use as construction set.

3.02 AS-BUILT RECORD DOCUMENTS

A. As-built locations of new sewer manholes, sewer mains, service laterals and cleanouts shall be topographically surveyed by a registered land surveyor licensed in Hawai‘i, including the following data:

1. Pipe distance and azimuth,

2. Pipe invert elevations at incoming and outgoing pipes

3. Top and bottom pipe inverts at drop or shallow drop manholes,

4. Top and bottom of manhole elevations at the center of manhole,

5. Upper and lower sewer lateral inverts and cleanout top elevations.

6. As-built locations of other relocated utilities shall also be provided to DHHL for record.

B. Data Required: Submit clean, accurate to-scale drawings showing pertinent plans, elevations, sections, and details affecting the Contract Work. Draw to scales similar to that used in Contract Drawings for similar kinds of represented work. Utilize same or similar references as Contract Drawings so Engineer can accurately locate and compare data in Contract Documents.

C. Time of Submission: Notify Engineer immediately upon discovering such differences and submit drawings so that issue can be resolved within a reasonable period as not to delay Project Schedule. Do not proceed with any work which is affected until Engineer provides resolution.

3.03 CONTRACT CLOSEOUT RECORD DOCUMENTS – CONTRACT DOCUMENTS

A. Time of Submission: Refer to DHHL CONSTRUCTION GENERAL CONDITIONS.

B. Intent: Update information shown on Contract Drawings and in Project Manual which differ from what was originally drawn or specified. Record drawn information accurately to scale. Written data to be legibly printed.

C. Contract Drawings and Project Manual: Keep record documents current. Legibly mark with erasable red pencils or other contrasting colored pencils when more than one color may more clearly delineate the recorded information. Where recorded to Contract Drawings, record information to same scale as drawing. Colored pencil marks to be visible on background of sheet to which marks are applied.

D. Supporting Data: Other documents may be used in lieu of Contract Documents; when complying with following.

1. Conditions for Acceptance:
    a. Documents capable of more clearly showing actual installations provided.
    b. When documents are required as drawings, drawn elements are to be in an Engineer acceptable engineering scale.

c. Each document is referenced to Contract Documents in logical manner that documents used can be readily identified with the affected Contract Document work.
d. Submittal format is complied with 3.03D.3.

2. Types of Base Documents available for Use:
   a. Product Data: May be used in place of Contract Drawings or Specifications.
   b. Shop Drawings: May be used in place of Contract Drawings.
   c. Other Documents: Any other documents officially used for Project and previously reviewed by Engineer in submittals may be used when acceptable to Engineer.

3. Submittal Format:
   a. Intent: Sequentially organize data as referenced in Contract Documents. Data may be provided in either bound or filed format as specified in Paragraphs 3.03.D.3.c. Each data to be indexed and clearly identified with typewritten labels.
   b. Bound Data: Provide in format similar to that required for Operations & Maintenance Manuals; except each drawing is to be neatly folded in 8-1/2" x 11" format and inserted into pocket type jackets manufactured for binder insertion.
   c. Filed Data: Provide filed data in "Bankers Box" as manufactured by Fellowes or comparable heavy duty card board box acceptable to Engineer. Each data to be filed into logical groupings in file folders and clearly identified. Drawings are to be neatly folded to fit file folder format.
   d. Marking Data: Mark Project applicable data. Utilize permanent contrasting markers. Written data to be highlight marked with transparent markers. Drawn data to be with opaque markers. Do not obscure other information.

E. "Record Documents" Labeling:

1. General: Stamp each page in permanent ink, words "RECORD DOCUMENTS", in bold capital letters, on bottom outside corner; unless otherwise acceptable to Engineer. Do not obscure any existing information. Each page means both sides of sheet where printed matter occurs on both sides.

2. Drawings: Letters of stamp to be 3/4" height minimum.

3. Project Manual: Letters of stamp to be 1/4" height minimum.

4. Support Data: Letters of stamp to be 1/4" height minimum. Single stamped label may be applied when data is on single folded page or in

permanently bound format such as spiral bound or paperback book type binding.

END OF SECTION

SECTION 02110 - TEMPORARY SOIL EROSION CONTROL

PART 1 - GENERAL

1.01 GENERAL CONDITIONS: The General Conditions, General Specifications and Special Provisions preceding these specifications shall govern this section of the work.

1.02 WORK INCLUDED: Submit three (3) sets of the erosion control materials for approval by the Project Manager. Furnish all labor, materials, services, equipment and related items necessary to implement, inspect and maintain the temporary erosion control measures, submitted separately, to protect all disturbed areas (as shown or not shown on the Plans), as required by these specifications and as ordered by the Project Manager during the life of the contract to control water pollution through the use of berms, dikes, dams, sediment basins, fiber mats, netting, gravel, mulches, grasses, slope drains, filters and other erosion control devices or methods.

A. Temporary erosion and siltation control measures as described herein shall be applied to any erodible material within this project, including local material sources and work areas.

B. The Contractor shall be responsible for providing the necessary erosion control measures which are shown on the plans or which may be ordered by the Project Manager.

C. The Contractor shall be responsible for promptly (the day after a storm) removing all silt and debris resulting from his work and deposited in drainage facilities, roadways, neighboring lands, and other areas.

1.03 RELATED WORK IN OTHER SECTIONS:

Section 01430	Temporary Water Pollution, Dust, and Erosion Control
Section 01518	Environmental Pollution Control

PART 2 - PRODUCTS

2.01 MATERIALS

A. Mulches: To be bagasse, hay, stray, fiber mats, netting, wood cellulose, bark, wood chips, or other suitable material acceptable to the Project Manager and shall be reasonably clean and free of noxious weeds and deleterious materials.

B. Grass: To be a quick growing species (such as rye grass, Italian rye grass, or cereal grasses) suitable to the area and which provides temporary cover that does not later compete with the permanent cover.

C. Fertilizer and Soil Conditioners: To be a standard commercial grade acceptable to the Project Manager.

D. Compost Filter Sock: Refer to construction plans for construction requirements.

E. Silt Fence, Curb Inlet and Drain Inlet Filters: Refer to construction plans for construction requirements

PART 3 - EXECUTION

3.01 TEMPORARY EROSION CONTROL

A. The Project Manager has the authority to limit the surface area exposed by clearing and grubbing and to limit the surface area exposed. The Project Manager may also direct the Contractor to provide immediate, permanent, or temporary pollution control measures to prevent contamination of streams, lakes, ponds, drainage channels and pipes, roads, neighboring lands, and other areas.

Except for specified measures which may be shown on the plans the Contractor shall determine the appropriate erosion control measures to use. Such work may involve the construction of temporary berms, dikes, dams, sediment basins, and slope drains, and the use of temporary mulches, mats, and grassing, or the construction and use of other control devices or methods as necessary to control erosion.

B. The Contractor shall incorporate all erosion control measures shown in the plans. The erosion controls may be modified as necessary to adjust to conditions that develop during construction. All modifications are subject to approval by the Project Manager.

C. The Contractor shall limit the surface area exposed to that which is necessary for him to perform the next operation and which is within his capability and progress in keeping the pollution control measures current.

The grubbing of the vegetative root mat and stumps and the stripping of topsoil shall be confined within the limits of trenching which can be actively and continuously prosecuted within 15 calendar days. The area to be exposed shall be limited to the minimum area necessary to accommodate the Contractor's

equipment and work force and shall not at any time exceed 1 acre without prior approval of the Project Manager.

Any area remaining bared or cleared for more than 10 calendar days and which is not within the limits of active construction shall be immediately hydro-mulch seeded or remedied as directed by the Project Manager at the Contractor's expense without cost to the DHHL.

D. The Contractor shall, at the end of each work operation in any one day, shape the earthwork in such a manner as to control and direct the runoff to minimize the erosion of soils. He shall construct earth berms along the top edges of embankments or along the property line with adjacent properties, streams and water channels, to intercept any runoff. Temporary slope drains shall be provided by carry runoff from the top of cuts and fills. Temporary facilities for controlled discharges shall be provided for runoff impounded, directed, or controlled by project activities or by any erosion control measure employed.

E. Fill slopes shall be shaped, topsoil added if necessary, and planted as the work progresses. In no case shall the exposed surface be greater than 15 feet in height. Whenever major excavation is suspended or halted and the slope is bare for more than 15 consecutive days, the exposed surfaces shall be hydro-mulch seeded or protected as directed by the Project Manager at the Contractor's expense without cost to the Department of Hawaiian Home Lands.

F. Construction of berms, cofferdams, or other such construction in or near the vicinity of streams, ponds, waterways, or other bodies of water shall be approved materials.

G. The temporary erosion and siltation control measures outlined in these specifications are minimum requirements and shall not preclude the provision of any additional measures which the Contractor may deem necessary. Damages caused by the erosion of soils and the pollution of downstream areas shall be the responsibility of the Contractor and all costs for repairing, correcting, replacing, and cleaning damaged or polluted facilities shall be borne by the Contractor.

3.02 OPERATION & MAINTENANCE AND REMOVAL: Operate & maintain temporary erosion control devices per City ESCP standards. Repair any damaged devices to keep them function per design. Remove all temporary erosion control devices before closing the contract.

END OF SECTION

SECTION 02221 – TRENCH EXCAVATION AND BACKFILL

PART 1 - GENERAL

1.01 GENERAL CONDITIONS: The General Conditions, General Specifications and Special Provisions preceding these specifications shall govern this section of the work.

1.02 WORK INCLUDED: Furnish all labor, materials, tools, equipment and related items necessary for excavating and backfilling trench for installation of pipes and manholes in conformity with the dimensions, profiles, section and details shown on the plans. Work shall be governed by Section 11 of the "STANDARD SPECIFICATIONS" as amended herein and these SPECIAL PROVISIONS. The Contractor shall be solely responsible for the means, techniques, procedures, and sequences for dewatering and bracing and shoring the excavation.

1.03 SUPPLEMENTS: All excavated material shall be unclassified regardless of its composition, whether soil, solid rock, coral, asphalt pavement, concrete, rubbish or other material.

The installation and removal of trench shoring shall be done in a manner that will not cause settlement or disturbance of the pipe cradle material.

All existing ground, roadways and other improvements damaged, destroyed, or disturbed shall be, at the Contractor's expense, replaced, reconstructed and restored in kind to an equal or better condition satisfactory to the Project Manager.

1.04 STANDARD SPECIFICATIONS: The following specifications shall be made a part of this section:

A. "Standard Specifications for Public Works Construction," September 1986, as amended, Departments of Public Works County of Kauai, City and County of Honolulu, County of Maui, County of Hawai‘i of the State of Hawai‘i, hereinafter referred to as the "Standard Specifications."

B. "Water System Standards," 2002, as amended, Department of Water Supply, County of Hawai‘i, State of Hawai‘i, hereinafter referred to as the "Water Standards."

1.05 SUBMITTALS: The Contractor shall submit product data of the materials to be installed.

1.06 GEOTECHNICAL REPORT: Refer to "Geotechnical Investigation, DHHL West O‘ahu Sewer Improvements, Residential Subdivision, Wai‘anae, Hawai‘i, TMK: 8-5-030 through 033" dated April 14, 2021, prepared by Hirata & Associates, Inc.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Trench Backfill: Material shall be in accordance with the following section of the Standard Specifications, as revised, except as amended on the drawings and/or in the specifications herewith.

Trench Excavation and Backfill	Section 11
Borrow	Section 14

B. Pipe Cushion: Pipe cushion shall consist of No. 3B fine gravel as described by ASTM C33 (No. 67 gradation) or l-inch minus aggregate base course.

C. CLSM and LWCC: Refer to Section 03030, "Controlled Low Strength Material and Lightweight Cellular Concrete."

PART 3 - EXECUTION

3.01 STANDARD SPECIFICATIONS: This work shall be done in accordance with the following specification sections.

Sections 10 to 17 of the Standard Specifications, as revised, shall apply except as amended on the drawings and/or in the specifications herewith.

3.02 PLACEMENT AND COMPACTION OF BACKFILL

Trench backfill and compaction shall be done in accordance with the Standard Specifications, the recommendations included in the Geotechnical Report, shown on the Plans, and indicated in the following sections:

Section 02310	Crushed Rock Bedding
Section 02320	Crushed Rockfill and Subbase
Section 02330	Filter Fabric
Section 02510	PVC Sewer Pipe
Section 02600	New Sewer Manholes
Section 03030	Controlled Low Strength Material and Lightweight Cellular Concrete

Any loose/soft areas or cavities disclosed during trenching excavations shall be backfilled and compacted. This work shall be considered incidental to the various contract items.

Refer to Section 03030 for using controlled low strength material (CLSM) or lightweight cellular concrete (LWCC) for backfill. When CLSM or LWCC is used, no compaction is required.

3.03 DISPOSAL OF UNSUITABLE AND UNSED MATERIALS

The Contractor shall dispose of excavated materials unsuitable for backfill or unused for backfill off site at no additional cost to the DHHL.

END OF SECTION

SECTION 02310 – CRUSHED ROCK BEDDING

PART 1 - GENERAL

1.01 GENERAL CONDITIONS: The General Conditions, General Specifications and Special Provisions preceding these specifications shall govern this section of the work.

1.02 WORK INCLUDED: Furnish all labor, materials, tools, equipment and related items necessary for pipe bedding for installation of pipes and manholes in conformity with the dimensions, profiles, section and details shown on the plans. Work shall be governed by Section 15 of the "STANDARD SPECIFICATIONS" as amended herein. The Contractor shall be solely responsible for the means, techniques, procedures, and sequences for dewatering and bracing and shoring the excavation.

1.03 SUPPLEMENTS: All excavated material shall be unclassified regardless of its composition, whether soil, solid rock, coral, asphalt pavement, concrete, rubbish or other material.

The installation and removal of trench shoring shall be done in a manner that will not cause settlement or disturbance of the pipe cradle material.

All existing ground, roadways and other improvements damaged, destroyed, or disturbed shall be, at the Contractor's expense, replaced, reconstructed and restored in kind to an equal or better condition satisfactory to the Project Manager.

1.04 STANDARD SPECIFICATIONS: The following specifications shall be made a part of this section:

A. "Standard Specifications for Public Works Construction," September 1986, as amended, Departments of Public Works County of Kauai, City and County of Honolulu, County of Maui, County of Hawai‘i of the State of Hawai‘i, hereinafter referred to as the "Standard Specifications."

B. "Water System Standards," 2002, as amended, Department of Water Supply, County of Hawai‘i, State of Hawai‘i, hereinafter referred to as the "Water Standards."

1.05 SUBMITTALS: The Contractor shall submit product data of the materials to be installed.

1.06 GEOTECHNICAL REPORT: Refer to "Geotechnical Investigation, DHHL West O‘ahu Sewer Improvements, Residential Subdivision, Wai‘anae, Hawai‘i, TMK: 8-5-030 through 033" dated April 14, 2021, prepared by Hirata & Associates, Inc.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Pipe Bedding: Material shall be in accordance with the following section of the Standard Specifications, as revised, except as amended on the drawings and/or in the specifications herewith.

Crushed Rock	Section 15

B. Pipe Cushion: Pipe cushion shall consist of No. 3B fine gravel as described by ASTM C33 (No. 67 gradation) or l-inch minus aggregate base course.

PART 3 - EXECUTION

3.01 STANDARD SPECIFICATIONS: This work shall be done in accordance with the following specification sections.

Sections 10 to 17 of the Standard Specifications, as revised, shall apply except as amended on the drawings and/or in the specifications herewith.

3.02 PLACEMENT AND COMPACTION

Bedding and compaction shall be done in accordance with the Standard Specifications, the pipe manufacturer's instructions, the recommendations included in the Geotechnical Report and the following sections:

Section 02320	Crushed Rockfill and Subbase
Section 02330	Filter Fabric
Section 02510	PVC Sewer Pipe
Section 02600	New Sewer Manholes

Prior to placing crushed rock for bedding, any loose areas or cavities disclosed during trenching excavations shall be backfilled and compacted. This work shall be considered incidental to the various contract items.

3.03 DISPOSAL OF UNSUITABLE AND UNUSED MATERIALS

The Contractor shall dispose of excavated materials unsuitable for bedding or unused for bedding off site at no additional cost to the DHHL.

END OF SECTION

SECTION 02320 – CRUSHED ROCK FILL AND SUBBASE

PART 1 - GENERAL

1.01 DESCRIPTION: Crushed Rock Fill and Subbase shall consist of placing and compacting crushed rock material on prepared subgrade for sub-bedding as shown on the Plans. Crushed Rock Fill shall consist of filling soft spots below the Crushed Rock Bedding and subbase when directed by the Project Manager. Crushed Rock Fill is also used for gravel drain material. This work shall be considered incidental to the various contract items.

1.02 WORK INCLUDED: Furnish all labor, materials, tools, equipment and related items necessary for pipe bedding for installation of pipes and manholes in conformity with the dimensions, profiles, section and details shown on the plans. Work shall be governed by Section 14 of the "STANDARD SPECIFICATIONS" as amended herein. The Contractor shall be solely responsible for the means, techniques, procedures, and sequences for dewatering and bracing and shoring the excavation.

1.03 SUPPLEMENTS: All excavated material shall be unclassified regardless of its composition, whether soil, solid rock, coral, asphalt pavement, concrete, rubbish or other material.

All existing ground, roadways and other improvements damaged, destroyed, or disturbed shall be, at the Contractor's expense, replaced, reconstructed and restored in kind to an equal or better condition satisfactory to the Project Manager.

1.04 STANDARD SPECIFICATIONS: The following specifications shall be made a part of this section:

A. "Standard Specifications for Public Works Construction," September 1986, as amended, Departments of Public Works County of Kauai, City and County of Honolulu, County of Maui, County of Hawai‘i of the State of Hawai‘i, hereinafter referred to as the "Standard Specifications."

B. "Water System Standards," 2002, as amended, Department of Water Supply, County of Hawai‘i, State of Hawai‘i, hereinafter referred to as the "Water Standards."

1.05 SUBMITTALS: The Contractor shall submit product data of the materials to be installed.

1.06 GEOTECHNICAL REPORT: Refer to "Geotechnical Investigation, DHHL West O‘ahu Sewer Improvements, Residential Subdivision, Wai‘anae, Hawai‘i, TMK: 8-5-030 through 033" dated April 14, 2021, prepared by Hirata & Associates, Inc.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Crushed Rockfill: Material shall be in accordance with the following section of the Standard Specifications, as revised, except as amended on the drawings and/or in the specifications herewith.

Rock for Fill Section 14

Crushed rock fill and subbase material shall be ASTM D448 No.4 or No.5 size aggregate, unless otherwise directed by the Project Manager.

PART 3 - EXECUTION

3.01 STANDARD SPECIFICATIONS: This work shall be done in accordance with the following specification sections.

Sections 10 to 17 of the Standard Specifications, as revised, shall apply except as amended on the drawings and/or in the specifications herewith.

3.02 PLACEMENT AND COMPACTION

Prior to placing crushed rock for bedding, any loose areas or cavities disclosed during trenching excavations shall be backfilled and compacted. Rockfill and compaction shall be done in accordance with the Standard Specifications, the pipe manufacturer's instructions, the recommendations included in the Geotechnical Report as follows:

Unless otherwise indicated or directed by the Project Manager, Crushed Rock Fill and Subbase material shall be placed and spread in uniform layers not to exceed 12-inch. Each layer shall be compacted with a vibratory compactor to a dense consistency until little or no settlement of the ground is observed under repeated passes with the compaction equipment, but not less than six (6) passes per lift. Subgrade shall be compacted to not less than 95% of the maximum dry density based on ASTM D1557 test method. Crushed Rock Fill and Subbase material shall be encased in filter fabric with 12" overlap, unless otherwise indicated on the plans.

3.03 DISPOSAL OF UNSUITABLE AND UNSED MATERIALS

The Contractor shall dispose of excavated materials unsuitable for bedding or unused for bedding off site at no additional cost to the DHHL.

END OF SECTION

SECTION 02330 – FILTER FABRIC

PART 1 - GENERAL

1.01 DESCRIPTION: This special provision shall govern the furnishing and placing of filter fabric for the Crushed Rock Bedding and Crushed Rock Fill and Subbase as shown on the Plans and indicated in the SPECIAL PROVISIONS, or where directed by the Project Manager. This work shall be considered incidental to the various contract items.

WORK INCLUDED: Furnish all labor, materials, tools, equipment and related items necessary for installation of filter fabric in conformity with the dimensions, profiles, section and details shown on the plans.

1.02 SUBMITTALS: The Contractor shall submit product data of the materials to be installed. Provide manufacturer's product literature for the filter fabric including description of material and physical properties for Project Manager's approval in accordance with SPECIAL PROVISIONS Section 01300, "Submittal Procedures."

PART 2 - PRODUCTS

2.01 MATERIALS

The filter fabric shall be Mirafi 500X or approved substitute. The filter fabric shall meet the following minimum physical requirements:

FABRIC PROPERTY	UNIT	TEST METHOD	TYP. VALUE
Mechanical Properties			
Grab Tensile Strength	lb	ASTM D-4632	200
Grab Tensile Elongation	%	ASTM D-4632	15
Trapezoid Tear Strength	lb	ASTM D-4533	75
Puncture Strength	lb	ASTM D-6241	700
Performance Criteria During Service Life			
Apparent Opening Size	U.S. Standard Sieve	ASTM D-4751	40
Permittivity	sec^{-1}	ASTM D-4491	0.05
Flow Rate	$gal/min/ft^2$	ASTM D-4491	4
UV Resistance (@500 hours)	% Strength retained	ASTM D-4355	70

Any requests to substitute the filter fabric shall be subject to review and approval by the Project Manager.

PART 3 - EXECUTION

3.01 PROTECTION: The filter fabric shall be kept in a dry location and shall be protected from the direct rays of the sun .

3.02 INSTALLATION: Installment of the filter fabric shall be as shown on the Plans, as required by the Contract Documents, and/or as directed by the Project Manager. All laps and splices shall be a minimum 12-inches, unless otherwise indicated on the Plans.

END OF SECTION

SECTION 02510 – PVC SEWER PIPE

PART 1 - GENERAL

1.01 GENERAL

This section shall govern the furnishing and installing of the polyvinyl chloride (PVC) sewer piping. Unless otherwise indicated, PVC pressure pipe and fittings shall be utilized for gravity sewers and laterals.

1.02 SUBMITTALS

A. Certifications and product data shall include manufacturer's certification that all PVC pipe and fittings used for the gravity sewer lines for the Project meet the minimum requirements set forth in the Contract Documents and in standards nationally adopted by the industry, including PVC cell classification, elastomeric gasketed bell and spigot joint, size, shape, strength, chemical resistance, and pressure rating.

B. Submit all testing and inspection results to the Project Manager for review and approval.

C. As-Built Drawings: Prior to acceptance of the work, the Contractor shall furnish the Project Manager with two (2) sets of "as-built" drawings of the gravity sewer line installation, accurately drawn to scale, with all items (including, but not limited to sewers, manholes, laterals and cleanouts) identified by name and symbol, all inverts indicated, and including any other information required by the Project Manager. The work shall not be accepted until the "as-built" drawings have been approved by the Project Manager. The Contractor shall be responsible for all revisions to the "as-built" drawing required by the Project Manager prior to approval.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Polyvinyl Chloride (PVC) Pipe

1) PVC Pipe

Gravity sewer pipes ranging from 6-inches through 12-inches in diameter shall be PVC pressure pipe in compliance with AWWA C-900. PVC pipe shall be the Cast-Iron-Pipe Equivalent O.D. type, Class 150 (DR 18). Pipe joints shall be bell and spigot with an elastomeric gasket.

PVC pipe for gravity sewer shall be furnished complete with couplings of

the same type and composition as the pipe, gaskets conforming to ASTM F 477, and required lubricants. All gaskets and lubricants shall be made from materials that are compatible with the plastic material and with each other when used together, are suitable for wastewater service, and will not support the growth of bacteria.

PVC pipe for cleanout installation shall be 4 or 6-inches in diameter and shall be PVC pressure pipe in compliance with ASTM D1785. PVC pipe shall be iron pipe size pressure pipe, Schedule 80. All belled-end pipe shall have tapered sockets to create an interference type fit, which meet or exceed the dimensional requirements and the minimum socket length for pressure-type sockets as defined in ASTM D2672.

2) PVC Fittings

Fittings shall have elastomeric-gasket type joints suitable for wastewater service and shall be compatible with C-900 PVC pipes, or PVC drain waste vent (DWV) pipe fittings.

a) Fittings for 6-inch through 12-inch C-900 pipe shall be Class 150 one-piece injection molded and shall conform to the requirements of AWWA C-907. Gaskets shall conform to ASTM F-477 and be locked-in style. A flow transition ring, HARCO or approved substitute, shall be used at the downstream end of a 6-inch or 8-inch molded fitting having a DR higher than the upstream pipe section, to provide a gradual taper between cross-sectional areas.

b) PVC couplings and transition fittings (minimum DR 18) with elastomeric-gasket joints shall be provided as indicated on the plans and at connections to existing sewer laterals by the Contractor at his expense. Where indicated, or where necessary and approved by the Project Manager, couplings of the high deflection type allowing up to 5 degrees of deflection (2.5 degrees per side) shall be used. The center stop from couplings may be removed where closure type couplings are required.

a) Manhole adapter, sand coated: Manhole adapter for concrete manholes shall be a straight piece of Polyvinyl Chloride (PVC) pipe coated with sand on its exterior surface with a bell end and spigot end or have two bell ends. The adapter shall have a minimum length equal to the depth of the wall that the adapter will be embedded in.

Manhole adapter shall conform to AWWA C-900 for nominal sizes 4-inch to 48-inch. Manhole adapter shall have elastomeric-gasket type joints and have a minimum DR of 18. Gaskets shall conform

to ASTM F477 and be lock-in style.

Manhole adapter shall have a layer of sand completely covering its outer surface. Adapter may be visually inspected at any time prior to installation and any adapter with areas on its outer surface that are not covered with sand shall not be accepted.

Sand shall be securely embedded to the PVC surface of the adapter.

c) PVC DWV pipe fittings shall conform to ASTM D2665.

B. Repair Coupling

Repair couplings shall be used to connect new PVC pipe to existing pipe (vitrified clay pipe, terra cotta pipe, and cast iron pipe). The coupling shall be designed and constructed for connecting sewer lines of dissimilar pipe materials and sizes. Repair coupling shall be Mission Flex-Seal Adjustable Repair Coupling (ARC) or approved equal. The sleeve shall be manufactured of molded natural and synthetic rubber conforming to ASTM C 425 and ASTM C 1173. Shear rings shall be 300 series stainless steel with a minimum thickness of 0.012" and conform to ASTM A 240. Sealing clamps with nut and bolt takeup shall be surgical grade 316 stainless steel conforming to ASTM A-240.

PART 3 - EXECUTION

3.01 INSTALLATION

Depending the extent of pipe required to be replaced, the installation could be a joint to joint replacement or a portion of replacement by removing the defective portion only. Install required pipe fittings or couplings to connect the new pipe with the existing pipes.

3.02 CONSTRUCTION DETAILS

A. PVC Pipe and Fittings

1) PVC pipe and fittings for the gravity sewer lines for this Project shall be installed according to the requirements of the pipe and fittings manufacturers, the Contract Documents including this section, and as directed by the Project Manager.

2) Cleanout pipe shall be installed according to the requirements of the Wastewater System Design Standards, July 2017, and as shown on Standard Details S-04 and S-06, as applicable.

3) The Contractor shall visually inspect and test all pipes and appurtenances prior to the installation and shall assume full responsibility for the

soundness of the pipes and appurtenances installed.

4) Trench excavation and backfill shall be as specified in SECTION 02221, "Trench Excavation and Backfill." The Contractor will not be allowed the option of installing sewer pipes in the wet for all 6-inch sewer laterals and for sewer mains where the top of pipe is less than two feet below water.

5) Pipe Bedding: The Contractor shall provide Pipe Bedding as shown in the Contract Documents.

6) Inspect each pipe and fitting before and after installation; replace those found defective and remove from site.

7) Pipes shall be laid to the lines and grades, with a smooth uniform invert, a uniform support along the entire length. All pipe installation will require surveying between pipe joints to ensure pipe maintains the proper slope. Bending of PVC pipes will not be allowed. Provide batterboards not more than 16 feet apart in trenches for checking and ensuring that pipe invert elevations are as indicated. Laser beam method may be used in lieu of batterboards for the same purpose. The use of concrete blocks and wood wedges to adjust the pipe to proper line and grade is prohibited for crushed rock bedding. The concrete blocks may be used to adjust the pipe to proper line and grade for CLSM bedding. Laying of pipe shall commence at the lowest point, with the spigots facing in the direction of flow. Pipe shall be fitted together and matched so that when laid, it will form a sewer with a continuous, smooth and uniform invert.

8) Wyes for laterals shall be installed at connection to sewer main. For service laterals, rotate bends as required to minimize the need for deflection at fittings and couplings. Service laterals shall have uniform slope and straight alignment between the fittings and couplings used to connect to the sewer main and to the private property sewer lateral. Couplings of any type will not be permitted on the main PVC sewer lines, except as shown on the Plans near manholes, unless approved by the Project Manager. High deflection or closure/repair couplings will be permitted on laterals only where required, approved by the Project Manager, and located adjacent to fittings or at connection points at either end of the lateral. The Contractor shall provide at his expense additional fittings, special couplings, adapters, and other items of work not specified or shown to perform the lateral connection work.

9) Install pipe and fittings in accordance with the requirements of Uni-Bell PVC Pipe Association (UBPPA) UNI-PUBB-6, "Installation Guide for Solid-Wall PVC Sewer Pipe" and ASTM D2321, "Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications." For pipe-to-pipe push-on joint connections,

use only pipe with push-on joint ends having factory-made bevel; for push-on joint connections to fittings, cut spigot end of pipe off square and bevel pipe end as recommended by the pipe and fitting manufacturers. Use an approved lubricant recommended by the pipe manufacturer for the push-on joints. Assemble the push-on joint connections in accordance with the requirements.

10) All burrs and rough edges from cutting, grinding, filing or from the manufacturing process shall be sanded smooth to provide a smooth interior pipe surface. Any protrusions, abrupt changes and rough surfaces inside the pipe must be avoided to prevent accumulation of debris that leads to sewer clogging and increased maintenance. On downstream ends of connections to fittings, the inside edges of the spigot end of the pipe that is inserted into the fitting shall be rounded (minimum 1/8" radius) and sanded to minimize snagging of debris.

11) Provide proper facilities for lowering sections of pipe into trenches. Adjust spigots in bells to give a uniform space all around. Blocking or wedging between bells and spigots will not be permitted. Replace by one of the proper dimensions, pipe or fittings that do not allow sufficient space for installation of joint material. For crushed rock bedding, bell holes at each joint shall be provided in the bedding to permit the joint to be made properly.

Prior to the installation of a section of pipe, the circumference of the spigot end shall be marked to show the depth of the bell of the pipe. Upon proper embedding of the spigot end of the pipe against the bell, the pipe shall be pushed "home" to the preset mark on the pipe.

The pipe and fittings shall be laid in such a manner that the joints shall not be subjected to undue stresses. Pipes which may float during construction shall be restrained from movement as recommended by the manufacturer. In accordance with the pipe manufacturer's recommendations, the beveled end of the spigot shall be stopped short of being bottomed out in the bell to allow for sufficient gap for pipe expansion and avoid undue stresses and possible pipe breakage.

12) The interior of the sewer pipe shall be cleared of all dirt, joint compound, and superfluous or foreign material as the work progresses. Exposed ends of sewers shall be closed with approved temporary covers to prevent water, earth and debris from entering the pipe before leaving the work for the night. Should water, mud, and/or any other material enter any joint after the pipe has been laid in the trench, the joints thus affected shall be opened up either by removal of the pipes or by pulling the joints apart, and the joint thoroughly cleaned and replaced. Pipes which become submerged in water during the night shall be carefully checked each morning, and

pipes found "floated" from their proper positions shall be re-laid by the Contractor at his own expense.

13) The Contractor shall be responsible for maintaining all existing sewer services and for any fines, damage, and/or cleanup costs caused by sewage spills or backups. Temporary sewer laterals or bypass pumping shall be provided as required where the existing laterals must be removed due to interference with the new sewer line.

14) Because of the nature of PVC pipe and fittings, the Contractor shall exercise appropriate care in handling, loading, unloading, and storing such pipe and fittings so as to avoid damage. Before use, the pipe and fittings shall be properly stored per the manufacturer's recommendations. During transportation, vehicles with beds long enough to allow the lengths of pipe to lay flat shall be used. Defective pipe or fittings shall not be accepted. All pipes and fittings shall be covered with a minimum of 3" of an approved backfill material within 24 hours of passing the leakage test in the trench.

15) Any pipe, fittings or appurtenances which has been installed and proved defective shall be removed and replaced by the Contractor at no additional cost to the State.

16) The Contractor shall center load pipes with sufficient backfill to prevent arching and whipping under pressure. Joints shall be left exposed for inspection by the Project Manager during pressure testing if required.

17) Installation of the sewer pipe in concrete jackets shall be in accordance with the pipe and fitting manufacturer's recommendations, and applicable requirements of SPECIAL PROVISIONS Section 03020, "Reinforced Concrete Jackets." The pipe shall be centered and adequately supported and anchored to maintain the proper grade and clearances, and also eliminate floatation of and sags in the pipeline.

18) The locations of existing sewer laterals shown in the Contract Documents are based on available information from such sources as City and State records, cleanout locations, closed circuit television (CCTV) inspection tapes, and discussion with residents. The actual location of the sewer laterals may differ from that shown in the Contract Documents. The Contractor shall be responsible for determining the actual locations of the existing sewer laterals (for connection to the new laterals) by toning, probing, excavation, or other means at no additional cost to the State.

19) PVC pipes and fittings stored on the jobsite should be protected by UV resistant covers.

20) Leakage Test: All gravity sewers and fittings shall be tested for leakage by

low pressure air testing in accordance with SPECIAL PROVISIONS Section 02640, "Leakage Testing."

21) CCTV Inspection and Cleaning: As specified in SPECIAL PROVISIONS Section 02620, "Closed Circuit Television Inspection," newly installed sewers, with the exception of sewer laterals, will be required to be inspected by closed circuit television at the Contractor's cost to verify that there are no significant sags in the line. Pipes shall be CCTV inspected at 30 days after installation. Water shall generally be free draining between any two points at the pipe invert and no reverse grades will be allowed. The Project Manager may accept slight sags resulting in standing water up to approximately 1-inch in depth based on a case-by-case evaluation of flow conditions in the line and the propensity for future clogging problems. The Contractor shall be responsible for correcting sag problems determined to be significant by the Project Manager at no additional cost. Prior to the CCTV inspection, all water, mud, and/or debris within the lines shall be removed.

22) Mandrel Test for Deflection: A mandrel test shall be performed no sooner than 30 calendar days after the trench backfill is completed. In roadway areas, the 30 calendar day period shall begin after installation and compaction of bedding, backfill and subbase to within 2 feet of the finished pavement grade. A rigid nine-sled mandrel shall be pulled through the pipe by hand between adjacent manholes to detect for obstructions, deflections, out-of-roundness, joint offsets and lateral pipe intrusions. The mandrel shall have a cross section equivalent to a circle having a diameter at least 95 percent of the specified base inside diameter of the pipe (see the following table). The minimum length of the circular portion of the mandrel shall be equal to the nominal diameter of the pipe. The test shall be performed by the Contractor in the presence of the Project Manager. The Contractor shall be responsible for the costs of all materials, equipment and labor required to perform the testing. Any section of pipe that fails to permit passage of the mandrel shall not be accepted until properly repaired or replaced, and retested. Mandrel tests are not required for sewer laterals.

Nominal Pipe Size (inches)	Average Inside Diameter (Inches)	Base Inside Diameter (inches)
8	7.984	7.75
10	9.792	9.49
12	11.646	11.27

B. Buried Warning and Identification Tape

For newly installed PVC pipes longer than 3 feet, provide polyethylene plastic and metallic core or metallic-faced, acid-and alkali-resistant, polyethylene plastic

warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 3-inch minimum width, green in color, for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED SEWER LINE BELOW" or similar wording. Color and printing shall be permanent, unaffected by moisture or soil.

The polyethylene plastic tape shall have a minimum thickness of 0.004-inch. Tape shall have a minimum strength of 1500 psi lengthwise and 1250 psi crosswise. Tape shall be manufactured with integral wires, foil backing, or other means of enabling detection by a metal detector when tape is buried up to 3 feet deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection. Whenever a new roll of warning tape is required to be jointed to the end of an existing roll, the splice shall be made by overlapping the two ends a minimum of 6 inches and taping the entire overlapped section with duct tape.

C. Root Barrier

"Biobarrier" or an approved substitute root barrier shall be wrapped around all sewer pipe joints, fittings and appurtenances for direct buried, open trench installed, direct buried sewer mains and laterals. The root deterrent material shall extend a minimum 9 inches on either side of the joint. Overlap of material shall be 4-inches minimum. Method of fastening material to the pipe shall be as recommended by the manufacturer and subject to the approval of the Project Manager.

END OF SECTION

SECTION 02600 - NEW SEWER MANHOLES

PART 1 – GENERAL

1.01 GENERAL

This specification section applies to constructing 48-inch inside diameter reinforced concrete cast-in-place and pre-cast sewer manholes as indicated in the Contract documents including the STANDARD DETAILS.

1.02 REFERENCE STANDARDS

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

A. American Society for Testing and Materials (ASTM)

ASTM A48/A48M	Standard Specification for Gray Iron Castings
ASTM A1064	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A849	Standard Specification for Post-Applied Coatings, Pavings, and Linings for Corrugated Steel Sewer and Drainage Pipe
ASTM C478	Standard Specification for Precast Reinforced Concrete Manhole Sections
ASTM C923	Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals
ASTM C990	Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
ASTM C1244	Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill

B. American Water Works Association (AWWA)

AWWA C216	Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and

Grey-Iron Fittings

AWWA C219 Bolted, Sleeve-Type Couplings for Plain End Pipe

C. AASHTO LRFD Bridge Design Specifications, 7th Edition 2014, with subsequent interim revisions.

D. State of Hawai‘i, Department of Transportation, Highways Division, “Design Criteria for Bridges and Structures”, August 8, 2014.

1.03 SUBMITTALS

Submittal information shall comply with the requirements of SPECIAL PROVISIONS Section 01300, “Submittal Procedures”. The Contractor shall submit detailed information on his proposed procedures, equipment and materials to be used for sewer manhole construction for approval by the Project Manager within thirty (30) calendar days after the Notice to Proceed date. Design calculations and shop drawings shall be prepared and stamped by a Civil Engineer currently registered in the State of Hawai‘i. Physical properties of all materials shall be detailed. Additional information shall be provided as requested by the Project Manager.

A. Manufacturer certification for pre-cast manhole sections conformance to applicable ASTM requirements.

B. Manufacturer certification for pre-cast manhole section testing and conformance to design load.

C. Manufacturer shop drawings, and structural analyses for pre-cast riser sections and concrete base for manholes for manhole depths greater than 15 feet. Structural analyses shall be by a registered structural engineer. Shop drawings shall be stamped by a registered structural engineer.

D. Concrete and reinforcing steel testing and conformance per Contract Specifications.

E. Manufacturer product and testing data, and installation instructions for ASTM C923 pipe connection water tight resilient connectors.

F. Manufacturer product and testing data, and installation instructions for water tight seal for adjustment rings, cover frame, and top of manhole concrete top riser section or slab.

G. Test data for field concrete slump tests and compressive strength tests.

H. Manufacturer catalog and testing data for cast-iron manhole frame and cover to include design and dimensions.

I. Vacuum and exfiltration testing plan and result reports. Testing plan shall include personnel and their experience and qualifications, equipment, and procedures. Test results shall include manhole identification, date and time of test, tester name, and the Project Manager present during test.

PART 2 – PRODUCTS

2.01 PRECAST REINFORCED CONCRETE MANHOLE

A. Precast manhole base, wall, and cone sections, as well as grade rings, shall conform to ASTM C478. Minimum wall thickness shall be 5 inches for 48-inch diameter manholes. Reinforcement indicated as A_S shall be equal to or greater than the minimum required per 2017 City and County of Honolulu Wastewater System Standard Details.

B. Precast manhole components shall be designed to support vertical AASHTO H20 truck loads plus other loads from backfill and pavement materials at and above the cone section.

C. Manhole base shall be pre-cast or cast-in-place reinforced concrete as shown on the Plans and/or the Standard Detail Drawings as applicable.

D. Joint sealant for precast wall sections shall be preformed flexible plastic joint sealant that conforms to ASTM C990. Approved material is RAM-NEK manufactured by the Henry Company or approved substitute.

E. Manufacturer shall request for Project Manager inspection of pre-cast concrete pours made at its plant at least seven (7) calendar days prior to pour.

2.02 CAST-IN-PLACE REINFORCED CONCRETE MANHOLE AND MANHOLE BASE

A. Cast-in-place reinforced concrete manhole shall be as shown on the Plans and/or per the STANDARD DETAILS as applicable.

B. Concrete shall be 5,000 psi minimum compressive strength unless otherwise indicated in the Contract documents. Concrete shall be per the concrete section of the Standard Specifications in particular as applicable to sewer structures.

C. Reinforcing steel shall be deformed bars grade 60 conforming to ASTM A615. Welded wire mesh/fabric shall conform to ASTM A1064 unless otherwise indicated in the contract documents.

D. Hydrophilic waterstops shall be installed at all construction joints below ground level to form watertight joints in accordance with the manufacturer's instructions. Waterstops shall be Adeka Ultraseal MC-2010M or approved substitute.

a) Hardness shall be a minimum of 30.
b) Elongation shall be a minimum of 500%.
c) Tensile strength shall be a minimum of 100 pounds per square inch.

2.03 SEWER PIPE CONNECTIONS

A. PVC pipe and fittings shall conform to respective sections for those pipe types.

B. Grouted wall fitting for PVC pipe connections shall be as indicated in the Contract documents using a PVC bell X spigot gasketed manhole sand fitting of PVC pipe class matching the PVC sewer pipe, and fabricated to length as required or a spigot x spigot nipple as required.

C. Pipe connections utilizing watertight and flexible resilient connectors per ASTM C923 shall be of manufacturer and type as approved by the Project Manager. The connector shall be suitable for the sewer pipe being connected to the manhole. Metal components shall be stainless steel. Approved resilient connectors are A-LOK Premium or A-LOK X-CEL, Kor-N-Seal I EX or Kor-N-Seal II 206 Series, or PSX-Direct Drive or approved substitute. VCP or PVC wall pipe shall be as indicated in the Contract documents.

2.04 COUPLINGS FOR PVC PIPE CONNECTIONS

A. PVC Deflection Coupling

PVC deflection couplings shall be of the same class and for the PVC sewer pipe. Couplings shall be manufactured for a minimum of 2.5 degree angle change per bell joint. Allowable field deflections shall be limited to 2.0 degrees or 80 percent of manufacturer allowable deflection as approved by the Project Manager.

B. Transition Couplings

Transition Couplings for connecting pipes of different pipe outside diameters shall be cast type conforming to AWWA C219. Transition couplings shall have ductile iron sleeves and ductile iron end rings with gasketed joints. Nuts and bolt for cast couplings shall be 316 stainless steel unless otherwise indicated by the Contract documents. Ductile iron sleeves shall be epoxy coated.

2.05 MORTAR AND NON-SHRINK GROUT

Mortar and non-shrink grout shall conform to the requirements of the concrete section of the STANDARD SPECIFICATIONS in particular as applicable to sewer structures.

2.06 FRAMES AND COVERS

Frame and cover for manholes shall be cast iron conforming to ASTM A48/A48M, Class No. 30. Casting manufacturer and casting design including dimensions shall be as indicated by the Contract documents, or as approved by the Project Manager.

Castings shall be tough, close-grained gray iron, sound, smooth, and clean, and free of blisters, blowholes, shrinkage, and cold shuts.

Castings shall be fabricated accurately to dimensions, pattern and markings shown in the contract documents and machined as necessary for flat and true surfaces. Bearing surfaces shall be constructed so that cover lies flat on frame with snug fit in normal position.

Castings shall, before leaving shop, be thoroughly cleaned and painted on all sides with one coat of high-grade asphalt conforming to ASTM A849, Class M, Fully Coated.

2.07 EXTERIOR WRAP SEAL FOR ADJUSTMENT RINGS AND COVER FRAME

Exterior wrap to seal the pre-cast concrete or brick adjustment ring sections and cover frame resting on the manhole cone section as called for by the Contract documents shall conform to ASTM C923 and be of manufacturer and type as approved by the Project Manager. Adhesive shall be as supplied by the manufacturer.

Approved manufacturers and products are Infi-Shield Uni-Band by Sealing Systems, Inc., and Wrapid Seal Manhole Encapsulation System by CANUSA-CPS and CCPI Pipeline Systems LCC, or approved substitute.

2.08 BRICKS

Bricks shall be red brick conforming to ASTM C32 Grade MA or locally manufactured lava or cinder brick conforming to ASTM C55.

2.09 MANHOLE INFLOW INSERT

Refer to SPECIAL PROVISION Section 02632, “Manhole Inflow Inserts”.

PART 3 - EXECUTION

3.01 GENERAL

Construct manholes as detailed in the Contract documents.

3.02 EXCAVATION AND BACKFILL

Excavation and backfill shall be in accordance with Section 02221, “Trench Excavation and Backfill”.

The manhole base foundation shall be prepared to provide a firm and stable foundation. A minimum 6" crushed rock bedding shall be used for pre-cast concrete manhole for leveling. The crushed rock leveling course shall be enveloped in filter fabric and extend a minimum 6" beyond the concrete base outer edges. Filter fabric joints shall be overlapped 12".

Backfilling shall not be conducted until water tightness tests are completed and the results accepted by the Project Manager.

3.03 CONCRETE WORK

Concrete work for cast-in-place manholes and manhole bases shall be constructed in accordance with the concrete and reinforcing section(s) of the STANDARD SPECIFICATIONS. Allow concrete to set for at least 24 hours before removing forms and constructing additional work.

3.04 SEALING PRE-CAST MANHOLE SECTION JOINTS

Pre-cast manhole sections shall be sealed water tight using approved preformed flexible joint sealant. Sealant shall be installed per manufacturer instructions and requirements.

3.05 PIPE CONNECTIONS

A flexible joint shall be provided at the manhole wall as indicated by the Contract Documents. A PVC deflection coupling shall be used for PVC pipe connections. A bell joint shall be used for VCP. Where pipes of different diameters are connected, transition couplings shall be used which allow for deflection on joints. Pipe connections shall be water tight to prevent ground water infiltration into the manhole. Pipe connections to manholes using PVC fittings or pipe shall be as indicated by the Contract documents.

Water tight flexible resilient connectors may be used for pipe connections to manholes as indicated by the Contract documents. Resilient connectors and pipe connections shall be installed per manufacturer instructions. Resilient connectors shall not be grouted for joint flexibility unless specified by the manufacturer's installation instructions.

Openings made for pipe connections to existing manholes shall be thoroughly cleaned, mechanically roughened, and treated with epoxy bonding agent prior to grouting with non-shrink grout. Openings for use with resilient connectors shall be per the connector manufacturer's instructions.

3.06 CHANNELIZATION OF MANHOLE INVERTS

Manhole inverts shall be channelized and benches provided as indicated on the Contract Documents. Provide a minimum of 2% slope or average of connecting pipe slopes, whichever is smaller, for manhole flow channels.

Flow channels shall be smooth with steel trowel finish. Benches shall be solid with concrete, brick and grout. Grout finish over underlying concrete and/or brick shall be a minimum of 3 inches thick.

3.07 WATER TIGHT SEAL FOR ADJUSTMENT RINGS AND COVER FRAME

Exterior flexible water tight seal shall be provided as indicated by the Contract documents. The seal shall wrap around the adjustment rings to include overlap with the manhole cone riser section and the cover frame to provide a water tight seal between the pre-cast concrete riser section and the frame and cover. The seal shall be installed per manufacturer instructions and requirements. Seals shall not be grouted for flexible pipe connections as indicated by manufacturer instructions.

3.08 CONSTRUCTION NEW SEWER MANHOLE OVER EXISTING SEWERS

New sewer manhole at existing sewers to accommodate new sewers connections shall be constructed over the existing sewer. The existing sewer shall be cut to clean lines after construction of the manhole base to match the new manhole channelization

3.09 WATER TIGHTNESS

Manholes joints including at pipe connections, wall sections, and at adjustment rings and cover frame shall be water tight.

Joint seals and wrap seals shall be installed per manufacturer's instructions and recommendations.

A. VACUUM TESTING

1) Testing
Contractor shall test each manhole prior to backfilling by vacuum testing in the presence of the Project Manager. Contractor shall notify the Project Manager a minimum of seven (7) calendar days before each test to be conducted. Testing for manholes where ground water is above the manhole invert shall be by other method(s) as approved by the Project Manager.

2) Vacuum Testing
Vacuum test shall be per ASTM C1244. Contractor shall use experienced and qualified testing personnel. Safety precautions including securing and bracing plugs/seals shall be taken for the safety of the personnel conducting the tests, and for protection of equipment and constructed facilities. Manholes that fail the test shall be sealed as necessary and retested until the manhole passes the test requirements

3.10 EPOXY COATING

Epoxy coat manhole interior surfaces for corrosion protection and test/inspect coating per Section 02610, “Epoxy Coating System for Sewer Manholes”.

The interior surfaces include flow channels, manhole benches, wall, cone, top slab bottom, and grade adjustment rings.

3.11 FINAL CLEANING

Manholes shall be thoroughly cleaned after completion. Sewer pipes shall be protected to prevent debris and other foreign matter from entering.

END OF SECTION

SECTION 02610 - EPOXY COATING SYSTEM FOR SEWER MANHOLES

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

The Contractor shall provide all labor, supervision, tools, products, materials, and equipment for the application of a corrosion protective system consisting of an underlayment layer overlaid with an epoxy topcoat, for new cast-in-place or pre-cast concrete sewer manholes and existing sewer manholes to be rehabilitated, using procedures indicated on the Plans and specified herein.

Application of an epoxy protective coating system covered in this section shall include the following work as indicated on the Plans:

A. Apply trowelable underlayment and trowelable or sprayable epoxy coating to provide corrosion protection.

B. Inspection and testing of the work to ensure compliance with the Plans, specifications and the manufacturers' requirements for all products and materials used in the work.

The Contractor shall be responsible for the compatibility of all products and materials and the workmanship and quality of the overall coating protective system. The Contractor shall ensure that the requirements of the Contract Documents and the product and material manufacturers are fulfilled with respect to preparation, application, and testing.

Application of underlayment and epoxy coating shall be completed with required flow control at the Contractor's own design and cost.

1.02 SUBMITTALS

The Contractor shall submit the following to the Project Manager for review and approval within thirty (30) calendar days after the Notice to Proceed:

A. Products and Materials Qualifications

1) Underlayment Product

Provide the underlayment manufacturer's product description, application, installation and testing instructions, recommended shelf life, and written evidence, in the form of a letter, that the underlayment product has a minimum ten (10) year history of being manufactured and used successfully for rehabilitation or new sewer manholes. Written evidence

shall be in the form of a letter from the underlayment product manufacturer. In addition, the manufacturer or Contractor shall provide a list of at least three (3) reference sewer projects using the underlayment product having a minimum of ten (10) years of service life, including contractor's name, owner's name with contact person/telephone number, date, location, number of sewer manhole coated, product used, and application method. All projects performed in Hawai‘i shall be included on this list.

2) Epoxy Coating Product

Provide the epoxy coating manufacturer's product description, application, installation and testing instructions, recommended shelf life, and written evidence, in the form of a letter, that the epoxy coating product has a minimum ten (10) year history of being manufactured and used successfully for rehabilitation or new sewer manholes. Written evidence shall be in the form of a letter from the epoxy coating product manufacturer. In addition, the manufacturer or Contractor shall provide a list of at least three (3) reference sewer projects using the epoxy coating product having a minimum of ten (10) years of service life, including contractor's name, owner's name with contact person/telephone number, date, location, number of sewer manholes coated, product used, and application method. All projects performed in Hawai‘i shall be included on this list.

A predecessor underlayment or epoxy coating product number/name that has been modified into a newer version will be accepted in determining the minimum 10 years of service.

3) Letter from the epoxy coating manufacturer indicating that the underlayment products and epoxy coating to be used for the Project work under this section are compatible.

4) Material Safety Data Sheets (MSDS) for each product used.

B. Applicator Qualifications

1) For epoxy coatings, the Contractor shall provide a copy of a current certificate or written evidence from the epoxy coating manufacturer acknowledging successful training of each individual applicator to be utilized on this Project. The training certificate shall be renewed annually throughout the duration of the Project manhole/structure application work. The certificate or written evidence shall indicate the date(s) and location of the training, and description of items covered during the training. Training items shall include, but not be limited to, proficiency in surface

preparation, application, testing, coating repair, operation and maintenance of application equipment, and handling and storing of materials. Training certification shall match the proposed method of application (trowel or spray) that will be used by the Contractor for this Project.

2) For each individual applicator, submit a list of at least three (3) reference projects successfully completed in the United States within the past five (5) years, involving a minimum total of ten (10) sewer manholes successfully coated directly by the applicator using the same approved epoxy coating, same approved underlayment product, and same application method (trowel or spray) to be used on this Project. For each reference project, provide the owner's name, contact person, and telephone number; the applicator's employer's name, contact person, and telephone number; date, location, number of sewer manholes rehabilitated, products used, application method, and the applicator's responsibilities (surface preparation, application of epoxy coating, testing, etc.). All projects performed in Hawai‘i shall be included on this list.

Should the Contractor's proposed applicator(s) fail to meet the minimum experience requirements indicated above, the DHHL will accept applicators who have successfully completed the manufacturer's training and will perform the work with direct and constant field assistance and supervision from a currently certified trainer of the epoxy coating manufacturer. The Contractor shall submit the name and credentials of the certified trainer to the Project Manager for approval.

Unless otherwise approved by the DHHL, the certified trainer's credentials shall include a list of at least five (5) reference projects successfully completed in the United States, within the past ten (10) years, involving a minimum total of fifteen (15) sewer manholes successfully directly coated or directly supervised by the certified trainer of the epoxy coating manufacturer, using the same approved epoxy coating, same approved underlayment product, and same application method (trowel or spray) to be used on this Project. For each reference project, provide the owner's name, contact person, and telephone number; the trainer's employer's name, contact person, and contact telephone number; date, location, number of sewer manholes coated, products used, application method, and the trainer's responsibilities (surface preparation, application of epoxy coating, testing, etc.). All projects performed in Hawai‘i shall be included on this list.

The supervision period by the certified trainer shall be for a minimum of the first ten (10) sewer manholes for this Project, unless otherwise increased at the sole discretion of the Project Manager, and shall cover the surface preparation, epoxy coating, and testing phases.

3) Submit certification or other written evidence from the epoxy coating manufacturer that the equipment to be used on this Project for applying the products has been approved and the applicator personnel have been trained and certified for proper use, operation and maintenance of the equipment.

PART 2 – PRODUCTS

2.01 SEWER MANHOLE APPLICATION OF EPOXY COATING SYSTEM

A. Materials

The materials used shall be designed, manufactured, and intended for sewer manhole/structure application and particularly for the specific application for which this section and the Plans require. The materials, especially the underlayment product and epoxy coating, shall have a proven history of performance in sewer manhole/structure environment.

The materials shall be delivered to the job site in original unopened packaging and clearly labeled with the manufacturer's identification, printed instructions, lot number, and product manufactured date. The product shall not be used after the manufacturer's recommended shelf life has been exceeded. All materials shall be stored and handled in accordance with the recommendations of the manufacturer. Storage and handling of cementitious materials shall also comply with the applicable requirements of the American Concrete Institute (ACI). All materials shall be mixed and applied in accordance with the manufacturer's written instructions.

B. Underlayment Material:

A fast setting, high strength epoxy formulated underlayment filler compound product used to fill pockmarks, voids, and irregularities that may exist in the concrete surface prior to application of the epoxy coating. The underlayment shall be by trowel application only and shall be capable of being applied and bond to both vertical and overhead surfaces. It shall not contain any agents and components that would promote the corrosion of steel. The underlayment product shall be one of the following or an approved substitute for this specific Project. The required minimum underlayment thickness shall be according to product manufacturer's recommendation.

Alternative 1 – Sauereisen 209 or 209FS Restokrete Filler Compound: Minimum cure time prior to top coating three (3) hours for 209 and one (1) hour for 209FS. Bond Strength (ASTM D7234) shall be to concrete failure. Compressive strength shall be a minimum of 10,000 psi. Tensile strength (ASTM C307) shall be a

minimum of 2,200 psi. Flexural strength (ASTM C580) shall be a minimum of 4,000 psi. Minimum wet film thickness: skim coat (1 mil.)

Alternative 2 – Neopoxy NPR-5305 (trowelable): A high strength, high corrosion resistant modified epoxy resin designed for trowel application. Flexural strength (ASTM D790) shall be a minimum of 11,500 psi. Compressive strength (ASTM C579) shall be a minimum 12,000 psi. Tensile strength (ASTM D638) shall be a minimum 7,000 psi. Bond strength (ASTM D7234) shall be to concrete substrate failure. Minimum wet film thickness: 60 to 80 mils.

Alternative 3 – Raven 405 (trowelable): A high strength, 100% solids, solventless two-component epoxy resin system for spray application. Initial application of the material may be sprayed on but shall be trowel finished to ensure material completely fills all bug holes. The coating material shall be thixotropic in nature and filled with select fillers to minimize permeability and provide sag resistance in conformance with these specifications. Flexural strength (ASTM D790) shall be a minimum of 13,000 psi. Compressive strength (ASTM D695) shall be a minimum of 18,000 psi. Tensile strength (ASTM D638) shall be a minimum of 7,600 psi. Bond strength (ASTM D7234) shall be to concrete substrate failure. Minimum wet film thickness: skim coat (20-30 mils).

C. Epoxy Coatings

An epoxy coating suitable for application over damp or dry concrete surfaces and on vertical and overhead surfaces shall be used. When cured, the coating shall provide an impermeable, high strength lining for sewer manholes resistant to infiltration and attack from hydrogen sulfide and acid generated by microbiological sources known to exist in the sewer environment.

The epoxy coating product must demonstrate having sufficient corrosion resistance by satisfying either of the following two (2) third party test methods:

a) Achieved a combined score no greater than 2 for acid resistance (max. score of 1) and concrete bond (max. score = 1) in the Los Angeles County, John A. Redner, Evaluation of Protective Coatings for Concrete, December, 2004, Final Test Report.

b) Passed the "Greenbook" 2000 edition (or later), Standard Specifications for Public Works Construction, Chemical Resistance Test (Pickle Jar Test). Condition of acceptance: Maximum allowable weight gain or weight loss after a period of 112 days is +/- 1.5%. Submit results from third party test laboratory.

The epoxy coating shall be one of the following epoxy coating systems, or an approved substitute for this specific Project.

Alternative 1 – Raven 405: A high strength, 100% solids, solventless two-component epoxy resin system for spray application. The coating material shall be thixotropic in nature and filled with select fillers to minimize permeability and provide sag resistance in conformance with these specifications. Flexural strength (ASTM D790) shall be a minimum of 13,000 psi. Compressive strength (ASTM D695) shall be a minimum of 18,000 psi. Tensile strength (ASTM D638) shall be a minimum of 7,600 psi. Bond strength (ASTM D7234) shall be to concrete substrate failure.

Alternative 2 – Sauereisen SewerGard Trowelable No. 210: An impermeable, high strength, three-component system consisting of a two-component application. Flexural strength (ASTM C580) shall be a minimum of 4,900 psi. Compressive strength (ASTM D695) at twenty-eight (28) days shall be a minimum of 10,000 psi. Tensile strength (ASTM C307) shall be a minimum of 2,000 psi. Bond strength (ASTM D7234) shall be to concrete substrate failure.

Alternative 3 – Sauereisen SewerGard Spray Applied No. 210S: An impermeable, high strength, two-component fiber filled spray applied lining. Flexural strength (ASTM C580) shall be a minimum of 4,600 psi. Compressive strength (ASTM C579) shall be a minimum of 6,800 psi. Tensile strength (ASTM C307) shall be a minimum of 2,500 psi. Bond strength (ASTM D7234) shall be to concrete substrate failure.

Alternative 4 – Neopoxy NPR-5304 (spray): A high strength, high viscosity, high corrosion resistant modified epoxy resin designed for spray application. Flexural strength (ASTM D790) shall be minimum of 14,000 psi. Compressive strength (ASTM C579) shall be a minimum 13,500 psi. Tensile strength (ASTM D638) shall be minimum 7,500 psi. Bond strength (ASTM D7234) shall be concrete substrate failure. Abrasion Resistance (D4060-95, CS17) 50mg/1,000 @1,000 gram load.

Alternative 5 – Neopoxy NPR-5305 (trowelable): A high strength, high corrosion resistant modified epoxy resin designed for trowel application. Flexural strength (ASTM D790) shall be a minimum of 11,500 psi. Compressive strength (ASTM C579) shall be a minimum 12,000 psi. Tensile strength (ASTM D638) shall be a minimum 7,000 psi. Bond strength (ASTM D7234) shall be to concrete substrate failure.

PART 3 – EXECUTION

3.01 Safety: The Contractor shall perform all work in strict accordance with all applicable OSHA standards, especially with respect to those safety requirements regarding confined space entry. Precautions shall be taken to detour activity and traffic away from manhole work zones and to prevent falling debris from damaging the manhole openings.

3.02 Cleaning: All concrete and masonry surfaces to be coated shall first be cleaned in accordance with the recommendations of product manufacturers for the underlayment and epoxy coating to be used on this Project. All grease, oil, laitance, mortar, unsound concrete, and other foreign materials shall be completely removed. Cleaning shall be accomplished by pressure washing (hydro-blasting) at a minimum pressure of 4,000 psi. Debris from cleaning operations shall be collected in the manhole being cleaned and disposed of in an environmentally safe manner. Where there are conflicts in the level of cleaning or procedures between this section and the underlayment and epoxy coating manufacturers, the more stringent shall apply unless otherwise approved by the Project Manager.

3.03 Minimum cure time for new concrete manholes: For new precast or cast-in-place manholes requiring an epoxy coating, the concrete shall be allowed a minimum cure time to ensure the concrete is no longer hydrating prior to applying both underlayment product and epoxy coating. One of the following three cure time options shall be satisfied:

Option 1

a) Concrete shall be cured a minimum of 28 days.

Option 2

a) Concrete shall be cured a minimum of 14 days and have a minimum compressive strength of 3,000 psi at 14 days; and

b) Perform and satisfy ASTM D4263-83 Plastic Sheet Test outlined below.

Option 3

a) Use an approved concrete additive at time of concrete placement designed to accelerate cure time, such as Gill 33 Superbond additive or an approved substitute. Concrete shall be cured a minimum of 3 days; and

b) Perform and satisfy ASTM D4263-83 Plastic Sheet Test outlined below.

ASTM D4263-83 Plastic Sheet Test Method shall be performed to confirm the concrete is no longer hydrating. Should the presence of any moisture be evident on the test sheet after completion of the test period, the Contractor will not be allowed to apply both

underlayment product and epoxy coating, and shall wait a minimum of 24 hours before conducting a retest.

3.04 Working environment: The Contractor shall be responsible for providing all necessary equipment and materials to establish optimal environmental conditions that will ensure successful application of the corrosion protection system and as recommended by the product manufacturer. Environmental controls to be taken into consideration may include but shall not be limited to humidity, temperature, air ventilation, exposure to direct sunlight, and dust prevention. The Contractor shall submit a list of equipment and materials along with his proposed procedures as part of his Environmental Controls submittal, prior to application of the underlayment and epoxy topcoat.

3.05 Underlayment: Underlayment product, as described in Paragraph 3.A.1 above, is required on all surfaces to which epoxy coating will subsequently be applied. At no time shall epoxy coating be directly applied to manhole concrete surfaces without first applying underlayment product.

3.06 Epoxy coating: The Contractor applying the epoxy coating shall inspect all surfaces specified to be coated prior to application of the coating. The Project Manager shall be notified a minimum of three (3) days prior to the date of the epoxy coating application to provide the option of inspecting the prepared surface and observe the epoxy coating application. The Contractor shall address any concerns with the surface that may interfere with proper application, testing or performance of the epoxy coating.

The epoxy coating shall be applied in accordance with the manufacturer's recommendations. Surfaces to be coated shall include the manhole walls, benches, portions of the channels as indicated on the plans, cone and the interior of the brick/pre-cast concrete grade adjustment collar.

The epoxy coating shall be applied to the following minimum dry film thicknesses:

Alternative 1 – Raven 405: 90 mils

Alternative 2 – Sauereisen Sewergard Trowelable 210: 125 mils

Alternative 3 – Sauereisen Sewergard 210S: 90 mils

Alternative 4 – Neopoxy NPR-5304 (spray): 125 mils; 250 mils for the part of manholes exposed to flow (channels & benches)

Alternative 5 - Neopoxy NPR-5305 (trowelable): 125 mils

The minimum thicknesses are applicable to properly prepared smooth surfaces with a broom finish. Thicker coatings, as recommended by the coating manufacturer and as

approved by the Project Manager, shall be provided if a smooth broom finish surface is not provided.

During application of the epoxy coating, a wet film thickness gauge similar to the gauges described in ASTM D4414 shall be used by the Contractor to verify that the minimum thickness requirements are being met as part of the Contractor's own quality control procedures. Wet film thickness testing shall be in the presence of the Project Manager, unless otherwise waived by the DHHL. If waived, the Contractor shall submit documentation of each performed test including the wet film thickness measured and accompanying diagram of the test locations within the manhole. One (1) test shall be performed for each 30 square feet of coated surface.

The termination edge of the epoxy coating shall consist of an epoxy filling notch along the edge of the coating not limited to the following locations: around the sewer pipes at manhole wall penetration, at the top of the manhole cone, and at the sewer low flow line in the manhole channel. The edge seal shall consist of an epoxy filled embedded thickened edge created by filling a minimum 1/4–inch wide by minimum 1/4-inch deep groove cut into concrete. See construction drawings, for more details.

Manhole/structure work shall be performed and completed without interruptions that may render previously cleaned, prepared or coated surfaces to be unacceptable. If interruptions should occur, the surfaces shall undergo additional cleaning or preparation as recommended by the manufacturer of the sewer manhole/structure products.

3.07 Testing: All testing described below shall be conducted in the presence of Project Manager. The Contractor shall notify the Project Manager in writing at least twenty-four (24) hours prior to the testing.

After the epoxy coating has set hard to the touch and completion of all Project work affecting the sewer manholes, the coatings on all manholes protected with epoxy coatings shall be tested for holidays with high-voltage holiday detection equipment. Testing shall be in accordance with the applicable high voltage testing requirements of NACE SP0188-2006, "Standard Practice, Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates" or ASTM D 4787, "Standard Practice, for Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrates."

An induced holiday shall be made on to the coated concrete surface and shall serve to determine the minimum/maximum voltage to be used to test the coating for holidays. The spark testing equipment shall be grounded to the manhole frame or other location approved by the Project Manager. The spark tester shall be initially set at 100 volts per 1 mil (25 micron) of film thickness applied but may be adjusted as necessary to detect the induced holiday. All detected holidays shall be marked and repaired by abrading the coating surface with grit disk paper or other approved hand tooling method. After abrading and cleaning, additional protective coating material shall be hand applied to the repair area. All touch-up/repair procedures shall follow the epoxy coating manufacturer's

recommendations. The holidays and other defects shall be repaired by the Contractor at no additional cost to the DHHL.

Adhesion tests shall be performed on each coated manhole/structure. One adhesion test shall be performed on the manhole/structure wall for every ten (10) vertical feet, measured from the top of cover to invert. For manholes less than ten (10) vertical feet, at least one adhesion test shall be performed on the manhole wall. In addition, one (1) adhesion test shall be also be performed on the manhole bench. The Project Manager shall determine the specific locations of the tests in the manhole. Adhesion testing shall be conducted after the epoxy coating has cured per the manufacturer's instructions and in accordance with ASTM D7234 as modified herein.

The adhesive used to attach the dolly to the epoxy coating shall be rapid setting with tensile strength in excess of the coating product and permitted to cure in accordance with the manufacturer recommendations. The coating and dolly shall be adequately prepared to receive the adhesive. Prior to the pull test, the Contractor shall utilize a scoring device to cut through the coating until the substrate is reached. Extreme care shall be required while scoring to prevent micro cracking in the coating, since cracks may cause failures at diminished strengths. Failure due to improper dolly adhesive or scoring shall require retesting. The pull test shall meet and/or exceed 200 psi and shall include substrate adhered to the back of the dolly or no visual signs of coating product in the test hole. Pull tests with results between 150 psi and 200 psi shall be acceptable if more than fifty-percent (50%) of the substrate is adhered to the back of the dolly. If the initial adhesion test fails, a minimum of three (3) additional locations within the manhole/structure shall be tested, as directed by the Project Manager. If any of the retests fail, all loosely adhered or unadhered coating in the failed area, as determined by the Project Manager, shall be removed and replaced at the Contractor's expense. After each adhesion test is completed, the Project Manager shall verify the adhesion tester reading.

All adhesion test locations shall be repaired by the Contractor in accordance with epoxy coating manufacturer's recommendations, at no additional cost to the DHHL.

END OF SECTION

SECTION 02615 - MANHOLE CLEANING

PART 1 – GENERAL

1.01 DESCRIPTION

The work covered by this Special Provision shall consist of furnishing all labor, materials, equipment, and supervision to perform all work necessary to clean existing and rehabilitated manholes that are included in this project. All work shall be performed by experienced personnel using equipment and materials that meet the requirements hereinafter specified. The Contractor shall obtain a fire hydrant use permit from the Board of Water Supply (BWS) prior to any use of water from a fire hydrant. The Contractor shall obtain all necessary permits required for the proper disposal of debris and other materials resulting from the cleaning work.

Payment for manhole cleaning shall not be paid directly but shall be considered as included in the various price bids of the Project. No additional payment shall be made for additional cleaning necessary to achieve the specified degree of cleanliness.

1.02 SAFETY AND EXPERIENCE

The Contractor shall have a documented, in place safety and health program which meets or exceeds all Federal and State OSHA regulations, with emphasis on hazard free work in confined spaces and sewage environment.

1.03 SUBMITTALS

A. Work Procedure

Submit for review a description of the procedures to be followed to accomplish the work and the necessary equipment to be used. Submittal shall be made 30 calendar days prior to initiating the work.

B. Records

Maintain printed records of all cleaning performed, including manhole numbers, type of manhole, cleaning method(s) used, special remarks and observations, and other pertinent data. These records shall be available to the Project Manager for inspection during the performance of work and shall become the property of the DHHL after completion of the project.

PART 2 – PRODUCTS

2.01 EQUIPMENT

All designated sewer manholes shall be cleaned using vacuum, high velocity and/or

mechanically powered sewer cleaning equipment as specified, and the selection of equipment used shall be based on the condition of the sections at the time the work commences. The equipment and the methods selected for cleaning shall be capable of removing all dirt, sand, grease, rocks, air pockets, debris, sludge, concrete debris, and other deleterious materials from the manholes.

A. Vacuum Removal Cleaning Equipment

This equipment shall be truck mounted for ease of operation, and designed to use air movement for cleaning and vacuuming of materials in the sewer manholes. The equipment shall be capable of removing all materials a distance of 600 feet from the operating manhole. The equipment used will have the capability of moving a minimum of 8,500 cubic feet per minute (cfm).

B. High Velocity Hydrocleaning Equipment

All high velocity sewer cleaning equipment shall be truck mounted for ease of operation. The equipment shall have a minimum of 500 feet of one inch 10 high-pressure hose with a selection of four or more cleaning nozzles.

The equipment shall have a minimum capacity of 60 gpm and a working pressure of 1,200 psi. The equipment shall include a high velocity gun for washing and scouring manhole walls and floors. Manholes shall be pressure washed at a minimum pressure of 4,000 psi.

The equipment shall carry its own 1,200 gallon water tanks capable of holding corrosive or caustic cleaning or sanitizing chemicals, auxiliary engines, pumps, and a hydraulically driven hose reel. Any proposed cleaning chemicals shall first be approved for use by the Project Manager and the Collection System Maintenance Division of the City Department of Environmental Services.

All controls shall be located so that the equipment can be operated from above ground with minimal interference to existing traffic and/or danger to the operator.

Manhole and hose guides shall be used to protect the hose from wear and to lead the hose around buildings, trees, stationary equipment, etc.

PART 3 - EXECUTION

3.01 Materials: Materials resulting from the cleaning operations shall be trapped and removed at the manhole being cleaned. No materials shall be allowed to continue through the manhole into an adjacent sewer line section at any time.

A vacuum truck shall be used to remove heavy accumulations of material trapped. The

Contractor shall be responsible for properly disposing of all materials removed. All materials resulting from cleaning operations shall be removed and conveyed by the Contractor in an environmentally safe manner in accordance with Federal, State, and local laws and regulations to a suitable waste disposal site approved by the Project Manager. Under no circumstances shall sewage or solids be dumped onto street, or into streams, ditches, catch basins, storm drains, or the ocean.

3.02 Cleaning: Where hydraulically propelled cleaning tools are utilized, precautions shall be taken to ensure that the water pressure created does not cause damage or flooding to public or private property.

To attain the required degree of manhole cleaning, sewer flow controls as specified in Section 02731, "Sewer Flow Control" shall be provided.

Comply with required traffic control, and no open manholes shall be left unattended during the Contractor's operations.

When additional quantities of water from nearby fire hydrants are necessary to avoid delays in the normal working procedure and use of such quantities of water have been approved by BWS, the water shall be conserved and not used unnecessarily. No fire hydrant shall be obstructed at any time.

All sludge, dirt, rocks, sand, grease, and other solid or semi-solid materials resulting from all types of cleaning operations shall be trapped and removed at manhole being cleaned. Passing materials from manhole section to manhole section shall not be permitted. All solid or semi-solid materials resulting from the cleaning operations shall be removed from the Project area and properly disposed of by the Contractor. An appropriate disposal site shall be arranged for by the Contractor and approved by the Project Manager. All permits required for the proper transportation and disposal of the materials shall be the sole responsibility of the Contractor.

The Contractor shall be responsible for making all necessary arrangements for gaining access to the sewer manholes, including locating hidden or buried manholes, obtaining the right of entry from the property owner, etc..

3.03 Damage: All sewer cleaning equipment shall be used in a manner to ensure that all dirt, mud, sand, grease, air pockets and other fine materials have been removed. Satisfactory precautions shall be taken to protect the sewer lines and manholes from damage that might be inflicted by the use of the cleaning equipment.

Damage to private property, sewer pipes, manholes and appurtenances caused by the Contractor's work shall be repaired by the Contractor at no additional cost to the DHHL.

END OF SECTION

SECTION 02620 - CLOSED CIRCUIT TELEVISION INSPECTION

PART – 1 GENERAL

1.01 GENERAL

Closed circuit television (CCTV) inspection of newly installed sewer lines and existing rehabilitated/repaired sewer facilities shall be performed. Television inspection of sewer lines shall be internal inspection by insertion of a closed circuit camera, which records colored imagery, into the sewer line for the purpose of remote visual inspection to determine the condition of the pipe and joints, the location and extent of any breaks or obstructions, the degree of any infiltration, the location of service connections, and presence of abnormal line and grade conditions.

All video inspections shall utilize digital video on DVD as the primary source of documentation, with secondary field logs and written reports also being submitted to the DHHL.

1.02 WORK INCLUDED

A . Pre-rehabilitation inspection shall be performed on existing lines to be rehabilitated/repaired to document the existing conditions of the existing sewer lines and verify that cleaning has been performed as required by the Contract Documents. Line cleaning will be required to remove heavy debris that prevents the CCTV camera passing through the pipe to be inspected.

B. Upon completion of sewer line construction and rehabilitation, a post-construction CCTV inspection shall also be performed to verify that the work has been satisfactorily performed.

C. Traffic Control will be required for sewer manholes located in travel ways. Sewer flow control may be required if the camera is submerged under water.

The cost of all CCTV inspection work shall not be paid for directly, but shall be considered as included in the new sewer pipe installation work or sewer rehabilitation/repair work.

1.03 CONTRACTOR REQUIREMENTS

A. The Contractor shall have a documented, in place safety program which meets or exceeds all Federal and State OSHA regulations, with emphasis on hazard free operations in confined space.

B. The Contractor shall have successfully performed a minimum of 10,000 linear feet of television inspection work in sewer lines 8-inch or larger

diameter. The Contractor shall submit documentation of his meeting these requirements within 14 calendar days of the Notice to Proceed date. Documentation shall include copies of inspection videos and reports of prior successfully completed television inspection projects.

C. The Contractor shall utilize NASSCO Pipeline Assessment and Certification Program (PACP) certified personnel to perform the CCTV inspection. The Contractor shall submit proof of personnel certifications within thirty (30) calendar days after the Notice to Proceed date.

1.04 SUBMITTALS

A. Video Picture Quality Assurance

Within 14 calendar days of the Notice to Proceed date, the Contractor shall furnish the Project Manager with a video recording of actual prior sewer line inspection performed by the Contractor on another recent project which meets these job specifications and, upon approval, use this video recording throughout the Project as a standard which the Contractor's video picture quality must meet. This video recording shall become the property of the DHHL.

B. Work Procedure

Submit a description of the set up and work procedure to be followed to accomplish the work and the necessary equipment to be used for approval prior to start of closed circuit television inspection work.

C. Certification showing the requirements described in Section 1.03 above.

D. CCTV inspection documents: including inspection forms with PACP condition ratings, video and photos.

PART 2 - PRODUCTS

2.01 DOCUMENTATION

Documentation shall consist of electronic video files provided in DVD quality MPEG-2 color video format and written reports utilizing NASSCO PACP coding standards detailing the conditions of the sewer lines, pipe grade, pipe joints, lateral connections, linings, and manhole connections. The Contractor shall obtain the PipeTech template from the Project Manager for the established CSM naming convention. The reports shall note the time and date of video inspection, upstream and downstream manhole, direction of view, direction of flow, surface material, pipeline length, pipe section length, pipe size, pipe material, lateral connections, video recording number, counter number, and a detailed logging of defects

encountered. A map shall be provided in the report showing the sewer lines with manholes clearly labeled.

The sewer main "Sewer ID", as indicated in the City's GIS sewer feature layers, shall be used to identify the sewer pipes, laterals, and manholes on the video and image data files.

The naming convention of the CCTV files shall conform to the format established by the Collection System Maintenance (CSM) Division outlined as follows:

XXXXXX _YYYYMMDD_hh {one space} mm_ dddddd

Where:
XXXXXX _YYYYMMDD_hh {one space} mm_ dddddd
XXXXXX is the six or seven digit City Pipe Sewer Identification Number of the pipe inspected.

YYYY is the year in four digits that the video was generated.

MM is the month in two digits that the video was generated.

DD is the day of the month in two digits that the video was generated.

hh is the number of full hours past midnight in two digits that the video creation was started.

mm is the number of minutes past the hour in two digits that the video creation was started.

dddddd is the direction that the CCTV inspection camera proceeded during the video inspection. The only allowable values are Upstream and Downstream. This text will always have an uppercase first character with the remainder of the characters lowercase.

The following are correct filenames:

298389_20101123_13 41_Upstream.ptv 289611_20101123_10 29_Downstream.mpg

Each DVD disc or digital image shall be labeled with an identification number that provides a link to the other data tables and hard-copy logs.

All records shall be available to the Project Manager for inspection during the performance of work and shall become the property of the DHHL after completion of the Project.

A. Television Inspection Forms

Computer generated location records shall be kept by the Contractor that clearly show points of significance in relation to an adjacent manhole. Points of significance such as locations of laterals, infiltration, unusual conditions, roots, side main connections, broken pipe sections, presence of scaling and corrosion, pipe grade deficiencies, and other discernable features shall also be recorded and a copy of such records shall be submitted to the DHHL. These records shall be recorded on the "Television Inspection Report."

B. Photographs

Digital photos of the television picture of pipeline problems found shall be prepared by the Contractor upon request by the Project Manager. The Contractor shall record, on still photograph, sources and potential sources of infiltration/inflow, structural defects, and abnormal conditions for subsequent review.

C. Video Recordings

The purpose of video recordings shall be to supply a visual and audio baseline record of all new, rehabilitated and repaired sewer lines in the Project area.

Video recording playback shall be at the same speed that the video was recorded at. Slow motion and/or stop motion playback features may be supplied at the option of the Contractor. The Contractor shall have all DVDs and necessary playback equipment readily available for review by the DHHL throughout the Project. Recordings shall be taken and narrated by the operating technician during all phases of inspection and the work, and shall be submitted in Pipetech® or approved substitute format, and shall be capable of replay on a computer with a DVD reader and Windows Media Player software. All original DVD's of the video inspections shall be submitted to the DHHL upon completion of the video inspections. Two copies of the DVD quality, MPEG-2 color video files shall be submitted to the DHHL upon completion of the CCTV inspections. The DVDs shall be packaged in plastic cases for handling.

2.02 EQUIPMENT

A. Equipment used in the work of this special provision shall be produced by manufacturers regularly engaged in the manufacture of equipment specifically designed for sewer line inspection. CCTV equipment shall include television cameras, television monitor, cables, power sources, and other equipment. The remote-reading footage counter shall be accurate to less than

1% error over the length of the section of sewer line being inspected. The distance shall be measured from the centerline of the upstream manhole to the centerline of the adjacent downstream manhole. Telephones, radios, or other suitable means of communication shall be set up to ensure that adequate communication exists between members of the CCTV crew. The CCTV inspection system to be utilized on the Project shall be approved by the Project Manager prior to the work being performed.

B. The video camera shall be mounted on a skid, floatable raft system, or transporter based on the existing conditions of the sewer line to be televised. The camera and the skid, raft, or transporter system shall be furnished with emergency pullback cables of sufficient strength for all retrieving situations.

C. Cameras shall be of the "articulating head" type to allow laterals, pipe joints, and pipeline defects to be viewed directly. The inspection will be done in one manhole section at a time, and the section being inspected shall be suitably isolated from the remainder of the sewer line system and incoming sewer flows as required or as directed by the Project Manager.

1. The television camera used for the inspection shall be of color format, and specifically designed and constructed for such sewer line inspections. It shall be operative in 100% humidity and underwater conditions. Lighting for the camera shall provide minimal relative glare. Lighting and camera quality shall be suitable to allow a clear, in-focus picture of a minimum of six (6) linear feet of the entire inside periphery of the sewer pipe. The camera shall have a minimum resolution capability of 350 lines. To ensure peak picture quality throughout all conditions encountered during the video survey, a variable intensity control of camera lighting and remote control adjustments for focus shall be located at the monitoring station.

2. Focal distance shall be adjustable through a range from 6 inches to infinity.

3. Camera monitors shall be located within a temperature controlled studio which will allow seating for viewing by two DHHL personnel in addition to the Contractor's operating technician. There shall be available within the studio two or more viewing monitors operating simultaneously and of a proper size to allow all persons in the studio to have a satisfactory and comfortable view of the video presentation. Monitors shall have a resolution capability of no less than 650 lines. Continuously displayed on the monitors as part of the video presentation shall be the date of the survey, number designation of the manhole section being surveyed, and a continuous forward and reverse read-out of the camera distances from the manhole of reference.

4. Video equipment independent from the equipment used for monitoring of sewer line television inspections shall be made available to DHHL personnel for viewing of the video in the field. The video equipment may be mounted in the same truck as with the sewer line television inspection equipment, located in the Contractor's field office, or located at a nearby site approved by the Project Manager.

5. The audio portion of the composite signal shall be sufficiently free from electrical interference and background noise to provide complete intelligibility of the oral report. Audio reports shall be recorded by the operating technician on the video DVDs as they are being produced and shall include the location of the sewer, the names or numbers of the manholes involved, a manhole-to-manhole direction of travel, and a description of the conditions in the sewer line and manholes as they are encountered.

6. The video recording and the monitoring equipment shall have the capability to instantly review both video and audio quality of the DVD productions at all times during the television survey. The purpose of video recording shall be to supply a permanent visual and audio record of the manhole section surveyed. Two copies of the video files on DVD shall be submitted to the DHHL upon completion of the Project.

7. Still photos shall be taken at the request of the Project Manager or the discretion of the operating technician to record conditions of interest during the survey.

D. The Contractor shall have available on-site transmitters, which can be attached to the internal television camera and can transmit a signal from up to 16 feet in depth to an above ground receiver. Variable speed powered, remote controlled winches shall be furnished for upstream and downstream manhole locations to control two-way movement of the camera. Footage meter for recording the location of defects shall be used.

2.03 CCTV OPERATOR

The operating technician must be National Association of Sewer Service Company (NASSCO) Pipeline Assessment and Certification Program (PACP) certified and shall have full control of the movement of the television camera at all times. Remote control, manual winches, power winches, TV cables, and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer line and manhole conditions shall be used to move the camera. The travel speed of the camera shall be uniform and shall not exceed 20 feet per minute (fpm). Any means of propelling the camera through the sewer which exceeds a speed of 20 feet per minute (fpm) or

produces a non- uniform or jerky movement will not be acceptable. At no time shall the hose of a high velocity water cleaning machine substitute for a tow cable. Devices using elastic tow cables shall not be used. At the Contractor's discretion or at the discretion of the Project Manager, the camera shall be stopped and/or backed up to view and analyze in detail the conditions that appear unusual or uncommon to a good, sound sewer line. The operating technician shall at all times be able to move the camera through the line in either direction without loss of quality in the video presentation on the monitor or accuracy in footage measurement. The picture shall provide a clear, stable image of the resolutions specified.

2.04 QUALITY ASSURANCE

Before DVD's and reports are turned over to the Project Manager, they shall be reviewed by a professional who has a minimum of one year documented experience in evaluating and prioritizing problems in pipe systems as a NASSCO PACP CERTIFIED evaluator.

PART 3 - EXECUTION

3.01 SAFETY

The Contractor shall comply with all applicable traffic control requirements. No open manholes shall be left unattended during the Contractor's operations.

3.02 OPERATIONS

The CCTV inspection of sewer lines shall be done in accordance with NASSCO PACP standards and performed only by personnel with current NASCCO PACP certifications. The Contractor is responsible for maintaining sewer service at all times during the CCTV inspection, and making all necessary arrangements for gaining access to sewer manholes located in the public right-of-ways or private properties. No open manholes shall be left unattended during the Contractor’s operations.

A. Damage to private property, sewer pipes, manholes and appurtenances caused by the Contractor's work shall be repaired by the Contractor at no additional cost to the DHHL.

B. For newly installed sewers with low or no wastewater flow, potable water shall be discharged at the upstream end of the line being inspected at a rate of 5 to 10 gpm throughout the entire inspection to allow evaluation of the line slope and to facilitate detection of significant sags.

C. The inspection shall generally start at the upstream sewer manhole. The camera shall be moved through the sewer lines in the downstream direction at a uniform rate without loss of quality in the video presentation. In no case shall the

television camera be pulled at a speed greater than 20 feet per minute. The picture at all times shall be free of electrical disturbances and provide a clear and stable image of the resolution specified.

D. The operating technician shall stop the camera as necessary to permit proper documentation of the conditions of the sewer lines. Camera travel shall be stopped at locations where any of the following conditions are observed:

a. Infiltration or inflow;
b. Deformed pipes,
c. Structural defects, including broken pipe, holes, deformed or collapsed pipe, cracks, fractures, deterioration, punctures, etc.,
d. Abnormal conditions, including horizontal and vertical misalignments, open joints, joints not fully seated,
e. Root intrusions,
f. Protruding pipes,
g. Material deposits,
h. Other conditions, such as pipe material or size changes.

E. Report severe structural and operation conditions (PACP Condition 5) immediately to the Project Manager for immediate actions from DHHL.

F. The operating technician shall pan the camera at all laterals. If flow is being discharged from the lateral, the camera shall be focused on the lateral for a minimum of 30 seconds to help determine if the flow is steady and due to infiltration.

G. The operating technician shall stop the camera at sewer manhole and pan it around and up to inspect manhole conditions, including flow channels, benches, wall, cone and the manhole cover.

H. Accurate distance measurements shall be required. Measurement for locations of defects shall be made above ground by means of a metering device unless otherwise directed by the Project Manager. The Contractor shall mark these locations as directed by the Project Manager. Marking on cables, or the like, which would require interpolation and adjustments for depth of manhole, will not be allowed. Accuracy of the distance meter shall be checked by use of a walking meter, roll tape, or other suitable device and the accuracy shall be satisfactory to the Project Manager. The meter shall be accurate to 1% of the total distance as determined by a walking meter, roll tape, or other suitable device.

I During any video inspection, if the television camera will not pass through the entire manhole section, the Contractor shall reset the equipment at the downstream manhole and attempt to inspect the section from the opposite direction. If the camera again fails to pass through the entire section, it shall be

assumed that an obstruction exists. Efforts to televise that section of sewer line shall be temporarily suspended and the Contractor shall notify the Project Manager.

J. If the television camera lens becomes submerged during the inspection operation due to a sag in the pipeline, the Contractor shall record the conditions of the sag (i.e., length, maximum water depth noted) before continuing inspection on the remainder of the manhole section. Water depth shall be noted in 5 percent increments.

K. After the pre-rehabilitation video inspection has been completed, should it be determined by the Project Manager that cleaning of the sewer lines do not meet the requirements of the Contract Documents, the Contractor shall reclean and reinspect the sewer lines at no additional cost to the DHHL. Likewise, after the video inspection of the new or rehabilitated lines has been completed, should it be determined by the Project Manager that the new or rehabilitated lines do not meet the requirements of the Contract Documents, the Contractor shall make the necessary repairs and reinspect the sewer line at no additional cost to the DHHL. This additional video inspection by the Contractor may be required by the Project Manager, at no additional cost to the DHHL, as many times as it is necessary until it has been documented on video that the required work has been satisfactorily completed. All CCTV, both Pre and Post, shall be submitted within 10 days of the actual video inspection.

L. If the inspection of a manhole to manhole pipe segment cannot be completed due to accessibility issues or heavy blockage issues, the Contractor shall reinspect the line from the other direction. Prior to reinspection, the Contractor shall remove the obstructions or lower the water level as required. The reinspection shall be done at no additional cost to the DHHL.

M. If the quality of any videotaping is deemed to be unacceptable by the Project Manager, the sewer line shall be re-televised at no additional cost to the DHHL.

3.03 FIELD DISCREPANCIES

The Contractor shall report any sewer system discrepancies immediately to the Project Manager, including but not being limited to different pipe sizes, and existing sewer pipes and manholes not shown in the City Sewer GIS Map.

END OF SECTION

SECTION 02631 – SEWER MANHOLE RECONSTRUCTION

PART 1 - GENERAL

1.01 DESCRIPTION

This section shall govern all work, materials, and equipment required for the reconstruction and rehabilitation of the existing sewer manholes. The manhole reconstruction work includes connection to new sewers, rechannelization and rung removal, repair and replacement of grade adjustment rings, frames and covers and inflow insert, surface restoration. All manholes requiring reconstruction are shown on the Plans.

The rehabilitation work covers the brick/pre-cast concrete grade adjustment collar, cone section, riser(s), benches, and flow channels, including patching holes, cracks, spalls and damaged concrete, and applying trowelable cementitious underlayment and trowelable or sprayable epoxy coating to improve the structural condition and provide corrosion protection. The Contractor shall be responsible for the compatibility of all products and materials with existing manhole materials and with each other, and the workmanship and quality of the epoxy coating system installation overall sewer manhole rehabilitation work. The Contractor shall ensure that the requirements of the Contract Documents and the product and material manufacturers are complied with for installation, inspection and quality control for each step of the work.

Reconstruction/Rehabilitation of sewer manholes shall be completed using appropriate traffic control and flow control measures, as required.

1.02 SUBMITTALS

Certifications and product data shall include manufacturer's certification that all products used for the gravity sewer lines for the Project meet the minimum requirements set forth in the Contract Documents and in standards nationally adopted by the industry, as well as epoxy coating applicator qualifications. Refer to Section 02610, “Epoxy Coating System for Sewer Manholes” for more information.

Submit no later than 30 calendar days after the contract Notice-to-Proceed date, in accordance with the requirements of Section 01300, “Submittal Procedures”. No reconstruction work shall be started prior to acceptance of the submittals required.

PART 2 - PRODUCTS

2.01 MATERIALS

The materials shall be designed, manufactured and intended for sewer systems, particularly for the specific application for which these documents and the plans require, shall have a proven history of performance, and shall be compatible with existing materials and with each other. Materials to be used include new manhole riser and cone

with the same size as the existing sewer manhole (if adjustment is more than 30"), pre-fabricated manhole adjustment rings, prefabricated manhole cover and frame, epoxy coating system, inflow insert, wrap seal (for new riser, cone and chimney), and brick and mortar. The materials used shall withstand AASHTO HS-20 wheel loading and follow Wastewater Design Standard Details from S-26 to S-34.

For epoxy coating system, refer to Section 02610, "Epoxy Coating System for Sewer Manholes".

For inflow insert, the Contractor shall reference SECTION 02632, "Manhole Inflow Inserts".

For mortar, grout, frame and cover, exterior wrap, brick, refer to Section 02600, "New Sewer Manholes".

PART 3 - EXECUTION

3.01 EXCAVATION AND REPLACEMENT OF PAVEMENT

Material in the exposed area shall be dug out of a sufficient depth to permit the required adjustment. Suitable materials (stockpiled) shall be tamped in place to form the subbase or the pavement. If additional materials are needed, suitable materials shall be added before the pavement is replaced.

Pavement restoration work around each manhole shall be completed the same day as manhole adjustment work is completed. Should adjustment to manhole extend beyond one day, the Contractor shall hold the frame in place using a temporary cold patch.

Pavement replacement not satisfactorily done by the contractor shall be reworked at no expense to the State.

Any debris that enters into the manhole during the performance of this work shall be removed immediately by the Contractor.

3.02 ADJUSTMENT OF MANHOLE FRAMES AND COVERS

Manhole frames shall be adjusted to the desired elevation by using brick, mortar, and grade adjustment rings as shown on the Plans.

The Contractor shall remove the existing manhole frame and cover and inflow insert (if any) if they are found to be defective and dispose of them accordingly. Replacement frames and covers and inflow inserts shall be as specified in the STANDARD DETAILS, STANDARD SPECIFICATIONS, and this SPECIAL PROVISIONS. The Contractor shall install the new frame, covers, inflow insert and concrete grade adjustment rings so that the top of the covers are at the proper elevations and not depressed to result in runoff entering the manhole during rains. The manhole frame shall be sealed using either a

manufactured or applied sealing method in accordance with the respective sections of these Specifications.

A waterproof coating for sealing joints inside manholes particularly between the metal frame casting and the cone section shall be used to eliminate inflow under manhole frame.

Upon completion of the adjustment work, the Contractor shall complete a Manhole Identification Form and take photos of the work performed to adjust the manhole to the desired elevation. The Manhole Identification Form shall be used by the Project Manager to ensure that no voids (leakage points) exist between the frame and supporting concrete surface. Interior wall surfaces shall be bagged smooth finished.

3.03 RECONSTRUCTION OF SEWER MANHOLE

A. Safety: The Contractor shall perform all work in strict accordance with all applicable OSHA standards, especially with respect to those safety requirements regarding confined space entry.

B. Sewer Flow Control: When depth of flow exceeds top of crown, the Contractor shall bypass/divert existing sewage flows from the existing manholes to be reconstructed or rehabilitated in accordance with Section 2731, "Sewer Flow Control", of these SPECIAL PROVISIONS. For depths of flows below top of crown, flow-through plugs or partial plugging may be used inside the project manhole. The Contractor may use partial plugging to maintain the flow levels within the upper pipe sections reaching the crown level, or lower, as determined by the Contractor, to avoid backing up laterals. Should these levels be exceeded, temporary bypass pumping shall be required, per Section 2731, "Sewer Flow Control," of these SPECIAL PROVISIONS. Where flow bypassing is required, bypassing capability shall not be removed or decreased before sewer reconstruction or rehabilitation is inspected and accepted by the Project Manager.

C. Concrete Grade Adjustment Rings: The Contractor shall remove the existing grade adjustment rings and install new pre-cast concrete grade adjustment rings between manhole frame and cone in accordance with the Plans, the respective sections of these Specifications, and STANDARD DETAILS and STANDARD SPECIFICATIONS.

D. All large holes or voids near adjustment rings shall be patched and all missing mortar shall be repointed using a nonshrink patching mortar. All cracked or disintegrated material shall be removed from the area to be patched or repointed exposing the sound subbase. All cracks not subject to movement and greater than 1/16 inch in width shall be routed out to a minimum width and depth of ½ inch and patched with nonshrink patching mortar.

E. Invert: Inverts shall be renovated on all manholes to be reconstructed. After

enlargement, thoroughly clean the invert and apply quick setting patching material in an expeditious manner. The material shall be trowelled uniformly onto the enlarged invert at a minimum thickness of ½ inch at the invert extending out onto the bench of the manhole sufficiently to tie into the structure. The finished invert surfaces shall be smooth and free of ridges.

F. Connection to Sewer Manholes: The Contractor shall install the connections between existing sewer manhole and new sewer system in accordance with the Plans, the respective sections of these Specifications, and STANDARD DETAILS and STANDARD SPECIFICATIONS. Pipe penetrations on existing manholes shall install manhole adapters conforming to the requirements of Section 2510, “PVC Sewer Pipe” or approved substitute, unless otherwise authorized by the Project Manager. "Econoseal" by Press-Seal Gasket Corporation, "A-Lok XL" by A-Lok Products, or approved substitute cast-in flexible connectors meeting ASTM C-923 may be used for penetrations at existing manholes. All flexible connectors shall be installed in accordance with the manufacturer's recommendations. Openings for cast-in flexible connectors on existing manholes shall be thoroughly cleaned, mechanically roughened, and treated with epoxy bonding agent prior to grouting with non-shrink grout.

G. Bench, Channel and Transition Section Reconstruction: New benches, channels, and transition sections shall be formed using quick setting, high strength polymer modified Portland cement non-shrink grout. The grout shall meet ASTM C-293, flexural strength 1900 psi 28 days, ASTM C-495, Splitting Tensile Strength, 750 psi 28-days, ASTM C-882, Bonding Strength 2,200 psi 28-days, and ASTM C-109, Compressive Strength 7,000 psi 28-days. The grout shall be added up to 50% by weight of clean, well graded aggregate conforming to 1" x No. 4 Coarse Aggregate grading. This quick-setting grout shall be mixed and applied as per manufacturer's specifications and the Standard Specifications. The grout shall be SikaTop 122 or an approved substitute.

H. For repairing the benches, a quick setting, high strength Portland cement based repair mortar prior to applying epoxy coating shall be used. The mortar shall be one of the following mortar products, or an approved substitute for this specific project. The Contractor shall submit a letter from the epoxy coating manufacturer indicating that the bench repair mortar, cementitious underlayment and epoxy coating to be used on this project are compatible.

Alternative 1 – SikaTop 122 Plus: The 28-day compressive strength (ASTM C109) shall be a minimum of 7,000 psi. The 28 day flexural strength (ASTM C293) shall be a minimum of 2,000 psi. The 28-day tensile strength (ASTM C496) shall be a minimum of 750 psi. The 28-day bond strength (ASTM C882) shall be to a minimum of 2,200 psi.

Alternative 2 – Sauereisen Restokrete Substrate Resurfacer No. F 121: See Paragraph 3.04 C for physical properties.

I. Rungs: Rungs shall be removed. Holes or voids shall be patched and all missing mortar shall be repointed using a nonshrink patching mortar.

J. Materials: The materials shall have a proven history of performance in sewer manhole reconstruction. The materials shall be compatible with existing sewer manhole materials, with each other, and with any other sewer reconstruction method used at the project site. The materials shall be delivered to the job site in original unopened packaging and clearly labeled with the manufacturer's identification and printed instructions. All material shall be stored and handled in accordance with the recommendations of the manufacturer and the American Concrete Institute (ACI). All materials shall be mixed and applied in accordance with the manufacturer's written instructions. Materials for specific applications shall be as follows:

1) Patching, Repointing, Filling, and Repairing Non-Leaking Holes, Cracks, and Spalls in Concrete and Masonry Manholes.

A premixed, nonshrinking cement based patching material consisting of hydraulic cement, graded silica aggregates, and special blend of powders and special plasticizing and accelerating agents which has been formulated for vertical or overhead use. It shall not contain chlorides, gypsums, plasters, iron particles, aluminum powder or gas forming agents, or any other agents and components that promote the corrosion of the steel that it may come in contact with. Set time (ASTM C191) shall be less than 30 minutes. One hour compressive strength (ASTM C109) shall be a minimum of 200 psi and the ultimate compressive strengths (ASTM C109) shall be a minimum of 5,000 psi.

Bond strengths (ASTM C882-modified) shall be a minimum of 1,700 psi. Leaking manholes shall be sealed with approved material prior to reconstruction.

After proper curing of the applied materials, any "bleed" pipes that were installed shall be removed and the holes plugged and coated with the specified materials.

3.04 MANHOLE WALL REHABILITATION

A. Materials

The materials shall be delivered to the job site in original unopened packaging and clearly labeled with the manufacturer's identification, printed instructions, lot number, and product manufactured date. The product shall not be used after the manufacturer's recommended shelf life has been exceeded. All materials shall be stored and handled in accordance with the recommendations of the manufacturer. Storage and handling of cementitious materials shall also comply with the applicable requirements of the American Concrete Institute (ACI). All materials shall be mixed and applied in accordance with the manufacturer's written instructions.

B. Cleaning

All concrete and masonry surfaces to be rehabilitated shall first be cleaned in accordance with the recommendations of manufacturers of the repair and rehabilitation products and epoxy coatings to be used on this project. All grease, oil, laitance, loose bricks and mortar, unsound concrete, and other foreign materials shall be completely removed. Cleaning shall be accomplished by pressure washing (hydro-blasting) at a minimum pressure of 4,000 psi. Exposed reinforcing steel shall be ground or sandblasted to shiny metal. Debris from cleaning operations shall be collected in the manhole being cleaned and disposed of in an environmentally safe manner. Where there are conflicts in the level of cleaning or procedures between this Special Provision and the epoxy coating manufacturer, the more stringent shall apply unless otherwise approved by the Project Manager.

The Contractor shall conduct pH tests on the walls and bench to ensure that the pH of the substrate is seven (7) or higher prior to applying any repair, rehabilitation and underlayment products. A minimum of two (2) pH tests shall be conducted per ten (10) vertical feet of manhole at representative locations with damaged concrete. All pH testing shall be conducted in the presence of the Project Manager.

C. Underlayment

For patching, repointing, filling, and repairing of large non-leaking holes, cracks, spalls and damages in concrete and sewer manholes, a fast setting, high strength Portland cement based underlayment material that has been formulated for vertical or overhead use by trowel application shall be used as an underlayment for a protective epoxy coating. It shall not contain any agents and components that would promote the corrosion of steel. The underlayment product shall be one of the following or an approved substitute. The Contractor shall submit a letter from the epoxy coating manufacturer indicating that the cementitious underlayment product and epoxy coating to be used on this project are compatible.

Alternative 1 – Sauereisen Restokrete Substrate Resurfacer No. F-121: Initial set time at seventy (70) degrees F shall not exceed eight (8) hours. The 24-hour compressive strength (ASTM C109) shall be a minimum of 3,900 psi. The 28-day compressive strength (ASTM C109) shall be a minimum 7,000 psi. The 7-day tensile strength (ASTM C307) shall be a minimum of 800 psi. The 7-day flexural strength (ASTM C580) shall be a minimum of 1,500 psi. The 7-day bond strength (ASTM C882) shall be a minimum of 2,200 psi.

Alternative 2 – Raven 755: Initial set time at seventy-two (72) degrees F shall not exceed eight (8) hours. The 24-hour compressive strength (ASTM C109) shall be a minimum of 3,000 psi. The 28-day compressive strength (ASTM C109) shall be a minimum of 9,000 psi. The 7-day splitting tensile strength (ASTM C496) shall

be a minimum of 800 psi. The 7-day flexural strength (ASTM C580) shall be a minimum of 1,500 psi. The 7-day bond strength (ASTM C882) shall be a minimum of 2,000 psi. The minimum wet film thickness shall be 500 mils.

Underlayment product, as described in Paragraphs 3.03 and 3.04 is required on all surfaces to which epoxy coating will subsequently be applied. At no time shall epoxy coating be directly applied to manhole concrete surfaces or repair, patching, sealing and bench repair products without first applying underlayment product.

D. Sealing

For sealing of active leaks, a rapid setting hydraulic water plug for sealing leaks shall be used. The compatibility of the product with the cementitious underlayment product, cementitious bench repair mortar, and epoxy coating to be used on this project shall be verified. The water plug shall be Sauereisen Instaplug No. F-180, Webac 151, or an approved substitute for this specific project.

E. Resurfacing

For resurfacing and repairing irregularities and providing the required underlayment for the epoxy coating on all interior surfaces of sewer manholes refer to Paragraph 3.04 C above.

F. Epoxy coatings for corrosion protection of concrete and/or masonry manholes:

Epoxy Coating: The Contractor applying the epoxy coating shall inspect all surfaces specified to be coated prior to application of the coating. The Project Manager shall be notified a minimum of three (3) days prior to the date of the epoxy coating application to provide the option of inspecting the prepared surface and observe the epoxy coating application. The Contractor shall address any concerns with the surface that may interfere with proper application, testing or performance of the coating.

The epoxy coating shall be applied in accordance with the manufacturer's recommendations. Surfaces to be coated shall include the manhole walls, benches, portions of the channels as indicated on the plans, cone, and the interior of the brick/pre-cast concrete grade adjustment collar. The epoxy coating shall be applied to the following minimum dry film thicknesses:

Alternative 1 – Raven 405: 90 mils.
Alternative 2 – Sauereisen SewerGard Trowelable No. 210: 125 mils.
Alternative 3 – Sauereisen SewerGard Spray Applied No. 210S: 90 mils.
Alternative 4 – Neopoxy NPR-5305 (trowelable): 125 mils.
Alternative 5 – Neopoxy nPR-5304 (spray): 125 mils.

The minimum thicknesses are applicable to properly prepared smooth surfaces with a broom finish. Thicker coatings, as recommended by the coating manufacturer and as approved by the Project Manager shall be provided if a smooth broom finish surface is not provided.

During application of the epoxy coating, a wet film thickness gauge similar to the gauges described in ASTM D4414 shall be used by the Contractor to verify that the minimum thickness requirements are being met as part of the Contractor's own quality control procedures.

The edge of the epoxy coating around the sewer pipes shall be provided with an edge seal along the edge of the coating. The edge seal shall consist of an epoxy filled embedded thickened edge created by filling a minimum 1/4–inch wide by minimum 1/4-inch deep groove cut into concrete around the sewer pipe.

The edge of the epoxy coating at the top of the manhole cone and at the sewer low flow line in the manhole channeling shall be provided with an edge seal along the edge of the coating. The edge seal shall consist of an epoxy filled embedded thickened edge created by filling a minimum 1/4–inch wide by minimum 1/4-inch deep groove cut into concrete as shown on the plans.

When applying an epoxy coating onto existing PVC liner, which first requires the application of an epoxy bonding intermediate or adhesive, the application of the epoxy coating shall be as stated in this Paragraph and Paragraph K.

An epoxy coating suitable for application over damp or dry concrete surfaces and on vertical and overhead surfaces shall be used. When cured, the coating shall provide an impermeable, high strength lining for sewer manholes resistant to infiltration and attack from hydrogen sulfide and acid generated by microbiological sources known to exist in the sewer environment. The epoxy coating shall be one of the following epoxy coating systems, or an approved substitute for this specific project.

Alternative 1 – Raven 405: A high strength, 100% solids, solvent-free two-component epoxy resin system for spray application. The coating material shall be thixotropic in nature and filled with select fillers to minimize permeability and provide sag resistance in conformance with these specifications. Flexural strength (ASTM D790) shall be a minimum of 13,000 psi. Compressive strength (ASTM D695) shall be a minimum of 18,000 psi. Tensile strength (ASTM D638) shall be a minimum of 7,600 psi. Bond strength (ASTM D7234) shall be to concrete substrate failure.

Alternative 2 – Sauereisen SewerGard Trowelable No. 210: An impermeable, high strength, three-component system consisting of a two-component application. Flexural strength (ASTM C580) shall be a minimum of 4,900 psi. Compressive strength (ASTM D695) at twenty-eight (28) days shall be a

minimum of 10,000 psi. Tensile strength (ASTM C307) shall be a minimum of 2,000 psi. Bond strength (ASTM D4541) shall be to concrete substrate failure.

Alternative 3 – Sauereisen SewerGard Spray Applied No. 210S: An impermeable, high strength, two-component fiber filled spray applied lining. Flexural strength (ASTM C580) shall be a minimum of 4,600 psi. Compressive strength (ASTM C579) shall be a minimum of 6,800 psi. Tensile strength (ASTM C307) shall be a minimum of 2,500 psi. Bond strength (ASTM D4541) shall be to concrete substrate failure.

Alternative 4 – Neopoxy NPR-5305 (trowelable): A high strength, high corrosion resistant modified epoxy resin designed for hand application to repair manholes. Flexural strength (ASTM D790) shall be a minimum of 11,500 psi. Compressive strength (ASTM C579) shall be a minimum 14,000 psi. Tensile strength (ASTM D638) shall be a minimum 7,000 psi. Bond strength (ASTM D4541) shall be to concrete substrate failure.

Alternative 5 – Neopoxy NPR-5304 (spray): A high strength, high corrosion resistant modified epoxy resin designed for spray application. Flexural strength (ASTM D790) shall be minimum of 14,000 psi. Compressive strength (ASTM C579) shall be a minimum of 13,500 psi. Tensile strength (ASTM D638) shall be minimum 7,500 psi. Bond strength (ASTM D7234) shall be concrete substrate failure.

G. Epoxy bonding intermediate or adhesive to enhance the bonding of the epoxy coating to existing PVC lining:

Epoxy bonding intermediate or adhesive shall be applied to properly prepared surfaces of the PVC lining of the existing sewer lines connected to sewer manholes prior to applying the sewer manhole epoxy coating as shown on the plans or specified herein. The epoxy bonding intermediate or adhesive shall enhance bonding of the epoxy coating to the PVC liner. The epoxy bonding intermediate or adhesive shall only be required if Raven 405 (Spray), Neopoxy NPR-5305 (Trowelable), or Neopoxy (NPR-5304) (Spray) epoxy coating is used on the project. No epoxy boding intermediate or adhesive shall be required if Sauereisen SewerGard Trowelable No. 210 or Spray-Applied No. 210S is used on the project. Epoxy bonding intermediate or adhesive shall be the following, or an approved substitute for this specific project:

Raven P-150 Primer (formerly Raven P-1) for use with Raven 405 (Spray) epoxy coating only: A solvent-free, 100% solids, two-component epoxy adhesive bonding intermediate for thermomelt plastics (including PVC, plasticized vinyl sheet linings, and ABS plastics). Flexural strength (ASTM D790) shall be a minimum of 7,000 PSI. Compressive strength (ASTM D695) shall be a minimum of 6,600 PSI. Tensile strength (ASTM D638) shall be a minimum of 4,000 PSI.

H. Preparing existing PVC liner for overlap with epoxy coating: all existing PVC liner to be overlapped with epoxy coating, as shown on the plans, shall be properly cleaned to remove oils, grease, waxes, form release compounds, sealers, salts, dirt, slime, mineral deposits, scale, rust and any other contaminants that may be present. After the PVC liner has been cleaned, the liner shall be abraded to provide a roughened surface. The cleaning and roughened surface are required to ensure proper bonding of the epoxy coating and the epoxy bonding intermediate or adhesive, if required, to the PVC lining.

I. Cleaning of the existing PVC liner to be overlapped with epoxy coating shall be performed as follows:

1) Detergent water cleaning followed by thorough rinsing with potable water or hot water (steam) cleaning. Allow surfaces to dry completely or dry with lint-free rags.

2) After cleaning per the requirements of the paragraph above, wipe or scrub with clean lint-free rags wetted with solvent. Allow solvent cleaned areas to dry completely by evaporation. Solvents used may be acetone, methyl ethyl ketone, PVC cleaner or others recommended by the PVC liner manufacturer.

   Solvents are hazardous and all safety precautions necessary shall be taken in regards to the use of solvents including, but not limited to, ventilation, ignition sources, and respiratory, eye and skin protection.

J. Roughening the surface of the existing PVC liner to be overlapped with epoxy coating shall be performed by abrasive blasting, grinding, sawing, filing, sanding or other hand or mechanical abrasion methods. The roughening shall create a surface profile but shall not damage, cut/tear through, or loosen the liner or any of the liner seams/welds, or compromise the liner's ability to protect the concrete to which it is attached from corrosion.

K. Epoxy bonding intermediate or adhesive required if using Raven 405 (Spray Applied), Neopoxy NPR-5305 (Trowelable), and Neopoxy NPR-5304 (Spray) epoxy coating: The Contractor shall inspect all PVC liner surfaces to be coated prior to application of the epoxy bonding intermediate or adhesive. Any debris on the surfaces shall be removed by vacuuming, water cleaning, or solvent wiping, and the surface shall be dried thoroughly. The Project Manager shall be notified a minimum of three (3) days prior to the date of the application of the bonding intermediate or adhesive to provide the option of inspecting the prepared surface and observing the application. The Contractor shall address any concerns the Project Manager may have with the surface that may interfere with proper application or performance of the epoxy bonding intermediate or adhesive.

The epoxy bonding intermediate or adhesive shall be applied by trowel, brush,

squeegee, or by other methods recommended by the manufacturer to the following wet film thickness:

Raven P-150 Primer: 60 mils, for Raven epoxy topcoat. Binding intermediate primer for Neopoxy topcoat, per manufacturer's recommendation.

During application of the bonding intermediate or adhesive, a wet film thickness gauge similar to the gauges described in ASTM D4414 shall be used by the Contractor to verify that the wet film thickness requirements are being met as part of the Contractor's own quality control procedures.

The epoxy bonding intermediate or adhesive shall be applied in accordance with the manufacturer's recommendations. Should the manufacturer's recommendations conflict with the requirements of this paragraph, the requirements of this paragraph shall be complied with.

L. PVC liners in the sewer manholes to be rehabilitated shall be removed and the surface shall be prepared for epoxy coating in accordance with this Specifications.

M. Infiltration: After the surface has been prepared, and prior to the application of mortar products, underlayment products and epoxy coatings, all infiltration shall be stopped by either plugging, chemical grout sealing, or installation of channels through "bleed" pipes at the bottom of the manhole. Prior to placing water plug, place a mechanical key by undercutting an abrupt edge completely around the area to be plugged. After plugging the leaks, manhole walls shall be dry and ready for structural rehabilitation.

N. Patching: A non-shrink patching mortar shall be used to patch all large holes/voids around removed rungs, joints, or pipes, spalled areas, and holes due to missing or broken bricks, and to repoint all missing mortar. All cracked or disintegrated material shall be removed from the area to be patched or repointed after exposing the sound subbase. All cracks not subject to movement and greater than 1/16 inch in width shall be routed out to a minimum width and depth of 1/2 inch and patched with non-shrink patching mortar.

O. Repair and resurfacing of surface irregularities: Portland cement underlayment product shall be used to fill, repair, and resurface smaller cracks, voids, pockmarks, bug holes, and other surface irregularities to provide the epoxy coating with a suitable smooth and even high-strength substrate and to prevent subsequent pinholes and holidays in the epoxy coating. Underlayment product shall be provided with a broom finish or other suitable finish recommended by the epoxy coating manufacturer. The minimum and maximum thicknesses of the underlayment product shall be in accordance with the underlayment product and epoxy coating manufacturers' recommendations.

P. Manhole work shall be performed and completed without interruptions that may

render previously cleaned, prepared or coated surfaces to be unacceptable. If interruptions should occur, the surfaces shall undergo additional cleaning or preparation as recommended by the manufacturer of the sewer manhole rehabilitation products.

Q. Testing: All testing described below shall be conducted in the presence of the Project Manager. The Contractor shall notify the Project Manager in writing at least twenty-four (24) hours prior to the testing.

After the epoxy coating has set hard to the touch and completion of all project work affecting the rehabilitated sewer manholes, the coating shall be tested for holidays with high-voltage holiday detection equipment. Testing shall be in accordance with the applicable high voltage testing requirements of NACE SP0188-2006, "Standard Practice, Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates" or ASTM D 4787, "Standard Practice, for Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrates."

An induced holiday shall be made on to the coated concrete surface and shall serve to determine the minimum/maximum voltage to be used to test the coating for holidays. A 1/16-inch diameter hole shall be drilled into the coating at a location 6-inches to 12-inches above the manhole bench, or at a location approved by the Project Manager. The spark testing equipment shall be grounded to the manhole frame or other location approved by the Project Manager. The spark tester shall be initially set at 100 volts per 1 mil (25 micron) of film thickness applied but may be adjusted as necessary to detect the induced holiday. All detected holidays shall be marked and repaired by abrading the coating surface with grit disk paper or other approved hand tooling method. After abrading and cleaning, additional protective coating material shall be hand applied to the repair area. All touch-up/repair procedures shall follow the epoxy coating manufacturer's recommendations. The holidays and other defects shall be repaired by the Contractor at no additional cost to the DHHL.

Adhesion tests shall be performed on each rehabilitated manhole. One adhesion test shall be performed on the manhole wall for every ten (10) vertical feet, measured from the top of cover to invert. For manholes less than ten (10) vertical feet, at least one adhesion test shall be performed on the manhole wall. In addition, one (1) adhesion test shall be also be performed on the manhole bench. The Project Manager shall determine the specific locations of the tests in the manhole. Adhesion testing shall be conducted after the epoxy coating has cured per the manufacturer's instructions and in accordance with ASTM D4541 as modified herein.

The adhesive used to attach the dolly to the epoxy coating shall be rapid setting with tensile strength in excess of the coating product and permitted to cure in accordance with the manufacturer's recommendations. The coating and dolly

shall be adequately prepared to receive the adhesive. Prior to the pull test, the Contractor shall utilize a scoring device to cut through the coating until the substrate is reached. Extreme care shall be required while scoring to prevent micro cracking in the coating, since cracks may cause failures at diminished strengths. Failure due to improper dolly adhesive or scoring shall require retesting. The pull test shall meet and/or exceed 200 psi and shall include substrate adhered to the back of the dolly or no visual signs of coating product in the test hole. Pull tests with results between 150 psi and 200 psi shall be acceptable if more than fifty-percent (50%) of the substrate is adhered to the back of the dolly. If the initial adhesion test fails, a minimum of three (3) additional locations within the manhole shall be tested, as directed by the Project Manager. If any of the retests fail, all loosely adhered or un-adhered coating in the failed area, as determined by the Project Manager shall be removed and replaced at the Contractor's expense. After each adhesion test is completed, the Project Manager shall verify the adhesion tester reading.

All adhesion test locations shall be repaired by the Contractor in accordance with coating manufacturer's recommendations, at no additional cost to the DHHL.

END OF SECTION

SECTION 02632 - MANHOLE INFLOW INSERTS

PART 1 – GENERAL

1.01 GENERAL

This special provision shall cover sewer manhole inflow inserts, in place complete, to be used to prevent inflow of rainwater into the sewerage system, reduce manhole cover rattling and flipping due to street traffic, and to stop dirt and debris from entering the sewerage system through the manhole cover.

Installation of inflow inserts on new or rehabilitated manholes shall not be paid for directly but shall be considered as included in the prices bid for the sewer manholes in which they are installed as scheduled in the Proposal.

1.02 SUBMITTAL

Certifications and product data shall include manufacturer's certification that all products used for the Project meet the minimum requirements set forth in the Contract Documents and in standards nationally adopted by the industry. The Contractor shall submit the product data as described in Section 2.01 to the Project Manager for review and approval.

PART 2 – PRODUCTS

2.01 PRODUCTS AND CONSTRUCTION REQUIREMENTS

A. Type "SA" manhole inflow inserts shall be obtained by the Contractor. Insert shall be manufactured by No Flow In Flow of San Antonio, Texas, or approved substitute.

B. The inflow inserts for Type "SB" frames and covers shall be obtained by the Contractor. Inserts shall be manufactured by Southwest Packing & Seals, Inc. of Shreveport, Louisiana, or approved substitute.

C. The inflow inserts for Type "SA" frames and covers shall have a lift strap made of 1-inch wide woven polypropylene web. The lift strap shall be attached to the bowl of the dish by a wide head stainless steel 3/16" rivet and a stainless steel 3/4" backup washer. All cut edges shall be seared to insure against unraveling.

D. The inflow inserts for Type "SB" frames and covers shall be constructed of 316 stainless steel with a thickness of not less than 18 gage. The insert shall have a straight side design to allow a loose fit into ring for easy removal. The insert must demonstrate a load test failure in excess of 3,000 pounds. There shall be no less than three ribs stamped in the bottom of the dish.

E. The inflow inserts for Type "SB" frames and covers shall have a handle of 3/16" plastic coated stainless steel cable. The cable shall be attached to the bowl of the dish by a #6 high grade stainless steel rivet. The cable shall be braided in a manner that resists cutting with common bolt cutters. The cable terminal and eye shall be stainless steel.

F. Ventilation for all inflow inserts shall be provided by a vent hole and/or a valve located on the side of the bowl. The hole or valve shall allow a maximum release of 5 gallons of water per 24 hours and shall not be affected by debris collecting at the bottom of the dish. Sewer gas shall be vented at one psi or less. The valve shall be made of nitrile for prevention of corrosion from contact with hydrogen sulfide, dilute sulfuric acid and other gases associated with wastewater collection systems.

G. All inflow insert bowls shall be provided with a gasket constructed of closed cell neoprene that is attached by pressure sensitive adhesive to the weight bearing surface of the dish. The gasket shall be compatible with the insert material to form a long lasting bond in wet or dry conditions.

PART 3 – EXECUTION

3.01 INSTALLATION

Manhole flow insert shall be placed between manhole frame and manhole cover, readily removed after removal of the manhole cover. The manhole frame shall be cleaned of all dirt and debris before placing the insert on the rim. The manhole inflow insert shall be fully seated around the manhole frame rim to prevent water from infiltrating between the cover and the manhole frame rim.

END OF SECTION

SECTION 02640 - LEAKAGE TESTING

PART 1 – GENERAL

1.01 DESCRIPTION

This section covers the requirements for leakage testing of the sewer pipes. Testing is required for all newly installed gravity sewer pipes within the Project. Test each segment of the sewer pipe, section by section, between adjacent manholes unless otherwise allowed by the Project Manager. Provide all required labor, equipment, materials, and necessary work required for testing. All costs associated with leakage testing, repair and/or replacement of pipelines that do not meet the specified test requirements, and re-testing of repaired sections, shall be included in the price bid for installation of the pipe as scheduled in the Proposal.

1.02 SUBMITTALS

Submit the following to the Project Manager in accordance with the conditions stated in Section 01300, "Submittal Procedures". Provide sufficient detail to allow the Project Manager to judge whether or not the proposed equipment, materials, procedures and qualifications will meet the Contract requirements.

A. Testing Equipment and Procedures: The Contractor shall submit a proposed testing plan and procedures for testing the completed pipeline. The test plan shall describe the limits of each test, types of bulkhead(s) or plugs to be used, locations of pressure gages, equipment, sketches illustrating procedure, the proposed testing schedule, and all other proposed test procedures. Submit methods to isolate and repair any leakage or damages found as a result of inspection and testing of the completed system.

B. Submit all testing results to the Project Manager within three (3) working days after the test is done.

PART 2 – PRODUCTS

2.01 EQUIPMENT

The Contractor shall furnish all pumps, piping, hosing, valves, test gages, test plugs, joint test apparatus, power, stop watch, and personnel required for conducting leakage tests. Pressure gages shall be capable of measuring pressures to an accuracy of 0.1 psi.

PART 3 – EXECUTION

3.01 NOTIFICATION

Notify the Project Manager at least three (3) working days in advance of testing any

section of the sewer. The Project Manager will observe all leakage tests.

3.02 TESTING PROCEDURES

A. All tests shall be made in the presence of the Project Manager.

B. Subject to approval by the Project Manager and provided that the tests are made within a reasonable time considering the progress of the project as a whole, and the need to put the section into service, the Contractor may make the tests when he desires. However, pipelines in excavation or embedded in concrete shall be tested prior to the backfilling of the excavation or placing of the concrete. No backfilling shall be done between any adjacent manholes and no concrete jackets shall be placed until the pipe between such adjacent manholes shall have passed the leakage testing, unless otherwise approved by the Project Manager in writing. All leakage tests shall be completed and approved prior to placing of permanent resurfacing. The Contractor must perform a pressure test, place and backfill, and remove steel plates as soon as the test is passed and shall avoid excessive amounts of steel plates left in place at a time.

C. Prior to testing, the Contractor and Project Manager shall make a visual inspection of the section of the pipeline to be tested. If the pipe or manhole appears visibly cracked after installation or shows signs of leakage, the Contractor shall replace the pipe or repair the leak and any cracks using methods approved by the Project Manager. The Project Manager shall be the sole judge in determining whether replacement or repair is warranted. The Contractor shall clean all pipes and manholes thoroughly and remove any debris prior to testing.

D. For all new gravity sewer lines, perform low pressure air leakage tests in accordance with Section 18.3D, "Testing Gravity Sewer for Leakage", of the STANDARD SPECIFICATIONS. Testing of sewer laterals will not be required.

E. Under no circumstances shall any person be allowed in the connecting manholes while an air pressure test is being conducted.

F. If leakage, as shown by the testing, exceeds the allowable amount, the Contractor shall do everything necessary to locate, uncover, and repair or replace the leaking or defective pipe, fitting, or joint, all at his own expense and without extension of time for completion of the work. Additional tests and repairs shall be made until the section passes the specified test. The Contractor shall repair all visible leaks, regardless of the limits of the leakage tests.

END OF SECTION

SECTION 02731 – SEWER FLOW CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION: The Contractor shall furnish all labor, tools, materials and equipment necessary, including traffic control plans and work necessary to control sewer line flows. The Contractor shall use one or more of the following flow control methods for temporary sewer flow control unless otherwise allowed by the Project Manager:

A. Temporary gravity flow diversion: A temporary gravity flow diversion line, laid in the trench with inverts similar to the existing sewer line to be passed, can be used to bypass around the sewers to be repaired or replaced. Gravity flow diversion uses flow through plugs, couplings, hoses and air tank (to inflate an inflatable/deflatable flow through plug).

B. Plugging and Blocking: Sewer line plugs shall be inserted into the line at an upstream manhole location. The plug shall be designed so that a portion of the sewage flow can be released as may be required. During the work, flows shall be controlled and shall be either completely shut off or reduced sufficiently to ensure proper performance of Contract work.

C. Pumping and Bypassing: Pumping equipment, piping, and any other appurtenant equipment and tools shall be furnished and placed by the Contractor to bypass all gravity sewer lines where work is being performed. Standby pumps of equal size shall be on-site during pumping operations. All pumps must be capable of pumping the highest of all Existing Design Peak Flows (Q_R), which accounts for existing population, daily peak flow, dry weather I/I and wet weather I/I.

While the bypass pumps may use electrical power (arranged by the Contractor) to keep noise levels controlled to within permitted limits, the standby bypass pumps shall be mechanically driven.

Staging areas for the bypass pumps are generally not shown on the plans. The Contractor shall be responsible for negotiating, acquiring, and paying compensation for the staging areas in accordance with SPECIAL PROVISIONS Section 01530, “Staging, Additional Work and Access Areas.”

If approved by the DHHL, temporary bypass piping may be laid on the surface of low volume roads during working hours if smaller than 3-inches in nominal diameter and if the hose is of the heavy-duty, lay-flat type that can accommodate low volume traffic, or if piping is smaller than 2-inches in nominal diameter and the piping protected by "speedbump" type protective ramps. Adequate warning signs shall be provided at all aboveground vehicular crossings.

Where additional temporary bypass piping is required, the bypass piping shall be buried (or using road ramps) in vehicular traffic areas, including driveways and

road travelways, if required by the Project Manager. Safe passage of pedestrian and vehicular traffic must be ensured through and around all bypassing equipment and materials. In areas not subject to vehicular traffic, temporary bypass piping may be laid on the ground surface as approved by the Project Manager, but shall be pinned firmly in place to prevent movement and/or breakage during usage. All temporary bypass piping joints and connections shall be positively sealed with no leaks occurring. When the sewage bypass system is in operation, the Contractor shall ensure that the system is continuously manned, operated, monitored and maintained by skilled personnel specifically trained and experienced in all aspects of such systems. Standby pumps shall be checked, maintained, and started up periodically to ascertain their operational status.

The Contractor shall coordinate with property owners for use of cleanouts for bypassing purposes. The Contractor shall provide to the Project Manager a list of addresses that require installation of cleanouts for bypassing purposes where no cleanout exists. The list shall be submitted within seven (7) calendar days of acceptance to allow sufficient time for DHHL to contact the homeowner and inform him that a cleanout must be installed.

All sewage flow from residences connecting to a sewer line shall have their flows bypassed or collected and disposed of to a downstream line. Pumping and collecting of sewage shall be performed by inserting a suction line into the sewer cleanout. If a cleanout is buried, the Contractor shall perform the necessary work to locate and expose the cleanout to complete the sewage flow bypassing work. For cleanouts that cannot be located, the Contractor may be required to install a new cleanout, per City Standard Details, upon approval or request from the Project Manager.

D. Hauling of Wastewater: Hauling provides an alternative for diverting small amount of wastewater flows around the pipes from sewer manholes. The contractor shall provide adequate wastewater hauling trucks that must be capable of hauling the highest of all Existing Design Peak Flows (Q_R), which accounts for existing population, daily peak flow, dry weather I/I and wet weather I/I.

Provisions shall also be made by the Contractor to haul wastewater from the manhole(s) in the event of an emergency or wet weather flow event. All costs associated with wastewater hauling as a result of any emergency or wet weather flow shall be paid for by the Contractor.

E. Where sewer flow controls and bypassing are used, precautions shall be taken to ensure that water levels do not create backups nor cause damage or flooding to any public or private properties. Any such damage, claims or fines due to the Contractor's operations shall be repaired, cleaned or compensated at the sole expense of the Contractor. The Contractor shall reference SECTION 01500, “Maintaining the Existing Wastewater System.”

1.02 CONTRACTOR REQUIREMENTS: The pumping and bypassing contractor/subcontractor shall have successfully performed a minimum of two projects requiring pumping and bypassing of sewer line of 6-inch or larger diameter and/or average daily flows larger than 1 million gallons per day (mgd). The Contractor shall submit documentation of his meeting this minimum requirement within fifteen (15) calendar days of the Notice to Proceed date. The documentation shall include name of project, name and address of owner, owner contact person and phone number, description of constraints, significant environmental concerns, and letters of confirmation and project completion from owner.

1.03 SAFETY: Sanitary sewers convey sanitary sewage and certain substances which may be considered hazardous. These substances may include hydrogen sulfide, a natural gaseous byproduct of sanitary sewage. The Contractor shall exercise extreme caution and comply with all applicable Federal, State, and City regulations and all applicable OSHA requirements when performing the required sewer work or when in the vicinity of any hazardous substances.

1.04 SUBMITTALS: The Contractor shall prepare and submit to the Project Manager for approval a proposed sewer flow diversion plan. The plan shall be submitted within sixty (60) calendar days after NTP and approved 30 calendar days prior to the start of actual flow diversion. The Contractor's proposed flow diversion/bypass plan shall include, but not be limited to, a sewer system map showing all sewer inverts, the anticipated sewage water level and rim elevations at manholes (record drawing information may be used, however, the Contractor shall adjust the elevations to reflect a common survey datum) in the areas affected by any diversion, anticipated peak sewage flows, and locations of plugs, pumps, piping, and monitoring sites for each stage of construction.

For wastewater hauling, provide hauling and dumping sites as well as the hauling routes. Obtain approval from the City and County of Honolulu, Department of Environmental Services for dumping at City’s wastewater facilities, including sewer manholes, wastewater pump stations or treatment plants.

The Contractor shall submit a contingency plan that outlines the actions to be taken in the event that any sewage spills should occur. The Contractor's bypass plan shall be approved by the Project Manager before any diversion of sewage flows will be allowed.

The Contractor shall also be responsible for designing and submitting traffic control plans (TCP) specifically for covering his bypass plan for approval from DHHL. Traffic control plans shall be designed by an engineer licensed in the State of Hawai‘i and shall conform to applicable provisions of the "Manual on Uniform Traffic Control Devices for Streets and Highways" (MUTCD), as amended, published by the Federal Highway Administration and SECTION 01350, “Traffic Control.”

For the streets maintained by the City and County of Honolulu, design of the Contractor's traffic control plans and obtaining approvals from the City Departments of Transportation Services (DTS) and/or Planning and Permitting (DPP) shall be the total responsibility of

the Contractor. For the State DOT HWY right-of-ways, the approval shall be from the State DOT HWY Traffic Branch. No additional time will be allowed for the design and processing for approval of the traffic control plans.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

Flow diversion plans included in the Contract Documents are conceptual only. Specific details and schemes for sewage bypassing, including bypassing of laterals from all properties (commercial and private), are left to the discretion and judgment of the Contractor. The Contractor shall develop site specific sewer flow control plans based on the construction means and methods to be used and submit the plans to the Project Manager for review and approval. Where required, the Contractor shall prepare additional required traffic control plans and obtain the necessary approvals at the Contractor's cost.

3.01 The Contractor shall adhere to the following requirements when performing any work to plug, pump or bypass sewage flows:

A. The Contractor shall continuously monitor the sewage water level elevations in cleanouts or manholes upstream and downstream of the Project area and at any discharge manhole where flow is being diverted or pumped to. The Contractor shall obtain approval from the Project Manager of all monitoring locations prior to commencing the bypassing or diversion of any sewage flows.

B. A trial diversion shall be performed one day before beginning work unless otherwise directed by the Project Manager. Trial diversion shall continue for two (2) consecutive hours in the presence of the Project Manager. Pumping equipment and piping shall be leak tested with potable water prior to pumping sewage.

C. In the event of an emergency, the Contractor shall be capable of immediately removing all plugs, diversion plates, bypass pumps, bypass piping, or any portions of diversion and bypass pumping equipment and materials as may be required.

D. Pumping equipment and piping shall be checked for leaks by the Contractor at all times. Leak detection shall be performed any time the bypass pumping system is disassembled, reassembled or modified. No leaks in the diversion piping shall be permitted. Any fines resulting from sewage spills due to the Contractor's work shall be the total responsibility of the Contractor.

E. Sewage flowing by gravity shall not be allowed to flow higher than one foot above the top of the crown of the flowing sewer pipe at any manhole or higher than the private lateral after the cleanout, whichever is lower, as a result of

construction or diversion activities. No diversion shall be implemented or left in place once the sewage level reaches aforementioned limits.

F. Where sewer flow controls are used, precautions shall be taken to ensure that sewer water levels do not create backups, damages, or flooding of public or private properties. Damages caused by the Contractor's operations shall be repaired and cleaned by the Contractor at no cost to the Owner. The Contractor shall also be responsible for the settlement of all claims for damages resulting from his work or actions.

G. The Contractor shall be responsible for monitoring for high sewage flow conditions and for temporarily suspending his sewage flow control activities if conditions warrant it. The Contractor shall also temporarily suspend his sewage flow control activities if so directed by the Project Manager. On-going Project work that requires sewage flow control shall be suspended until the conditions and the Project Manager allow for the resumption of the sewage flow control activities.

3.02 Following the completion and acceptance of each section of sewer line replacement or repair work, the Contractor shall remove all diversion and bypass pumping equipment and piping and the area shall be restored to its original or better condition. The Project Manager will evaluate the restoration work in accordance with the preconstruction site survey photographs, videotapes, and report of the project site provided by the Contractor.

END OF SECTION

SECTION 2810 - HOT MIX ASPHALT PAVEMENT

PART 1 – GENERAL

1.01 GENERAL

This work consists of the construction of asphalt pavement areas in accordance with this Special Provision. Unless otherwise specified herein or indicated on the Plans, all work shall conform to Section 34 (Asphalt Concrete Pavement) of the Standard Specifications.

1.02 SUBMITTALS

The Contractor shall submit for approval, the job mix formula for the Asphalt Concrete to be supplied for the project. The job mix formula shall indicate the source of aggregates, grades of bituminous material and proportion of the RACP to be used in the mix. The total amount of bituminous binder in the mix shall be between 4.5% to 8.0% by weight depending on the specified Asphalt Concrete Mix. All test data used to develop the job mix formula shall also be submitted. The job mix formula for the mixture shall be in effect until modified in writing by the Project Manager. Should a change in sources of materials be made, a new job mix formula shall be established and approved before the new material is used.

All data for the control and the acceptance testing shall be submitted.

PART 2 – PRODUCTS

2.01 MATERIALS

Asphalt Concrete Pavement shall conform to Section 34 of the Standard Specifications, except as modified by the following paragraphs:

A. The asphalt cement grade shall be PG 64-16.

B. Recycled Asphalt Concrete. If available, recycled asphalt concrete may be used. The Recycled Asphalt Concrete shall be a uniform mixture of crushed reclaimed asphalt concrete pavement (RACP), virgin aggregate, and asphalt cement.

1. The RACP shall be processed to provide a reasonably uniform gradation from fine to coarse with 100 percent of the material passing the 1/2-inch sieve. The extracted bitumen content for the crushed RACP shall be not less than 2.0% when tested in accordance with the requirements of AASHTO T 164.

The blend of virgin aggregate and crushed RACP shall produce a

combined mixture of acceptable gradation.

2. The proportion of RACP to virgin aggregate shall not exceed 20% crushed RACP by weight.

   Once established, the proportion of virgin aggregate to crushed RACP shall not be changed without the approval of the Project Manager.

3. Unless otherwise specified, Mix IV of the Asphalt Concrete shall be furnished for the surface layer of the Asphalt Concrete Pavement.

C. Tack Coat shall be in accordance with Section 407 of the HAWAI'I STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND PUBLIC WORKS CONSTRUCTION, dated 2005 as amended, except as revised in the Drawings or specifications hereinafter. Paragraphs concerning Measurements and Payments in the referenced section are not applicable.

2.02 MIX DESIGN

The bituminous mixtures shall be designed using procedures contained in Chapter III, Marshall Method of Mix Design, of the Asphalt Institute's manual Series No. 2 (MS-2), current edition, and shall meet the requirements of Table I below:

TABLE IREQUIREMENTS FOR MARSHALL METHOD OF MIX DESIGN

Test Property	Mix II	Mix III	Mix IV	Mix V*
Number of Blows	75	75	75	75
Stability, lb. (min. number)	2,000	2,000	2,000	2,000
Flow, 0.01 in.	8 - 16	8 - 16	8 - 16	8 - 16
Percent air voids	4-6	4-6	4-6	4-6
Percent air voids in mineral aggregate (min.)	13	14	16	18

*NOTE: No RACP shall be used as partial substitute for the gravel in the Mix V.

The job-mix formula for each mixture shall establish a single percentage of aggregate passing each required sieve size and a single percentage of bituminous material to be added to the aggregate.

After the job-mix formula is established, all mixtures furnished for the project shall conform thereto within the following ranges of tolerances in the Table II below:

TABLE II RANGE OF TOLERANCES FOR JOB-MIX FORMULA

Passing No.4 and larger sieves	± 7 percent
Passing No.8 to No. 100 sieves (inclusive)	± 4 percent
Passing No. 200 sieve	± 2 percent
Bitumen	± 0.4 percent

PART 3 – EXECUTION

3.01 CONSTRUCTION REQUIREMENTS

The compacted mixtures of the in place pavement shall not be less than 91 percent of the specific gravity (ASTM D2041, commonly called the Rice Method) of the combined mixture without voids.

The Contractor shall provide laboratory testing for control and acceptance functions during periods of mix productions: One (1) field Marshall Test, asphalt content test, gradation analysis, and specific gravity test for each mixture.

3.02 ACCEPTANCE SAMPLING AND TESTING OF THE BITUMINOUS MIXTURE

Two (2) core or cut samples per street or one core per repaved trench if paving is less than one traffic lane in width, for the determination of the thickness and density of the completed pavements (or using nuclear gauge for determination of density) shall be obtained and/or tested by the Contractor at no extra cost (including that to restore the affected area). The size and locations of the samples will be directed by the Project Manager.

Tests necessary to determine the conformance with requirements shall be performed by the Contractor.

END OF SECTION

SECTION 02820 - HOT MIX ASPHALT BASE

PART 1 – GENERAL

1.01 GENERAL

This work consists of the construction of asphalt concrete base only for restoration of pavement sections above backfilled utility trenches, where indicated on the Plans and as required for pavement restoration. Unless otherwise specified herein, installation of Asphalt Concrete Base (ACB) shown on the plans shall conform to Section 32 (Treated Bases) of the Standard Specifications.

1.02 SUBMITTALS

The Contractor shall submit for approval the job mix formula for the Asphalt Concrete Base (with crushed glass, virgin material or crushed RACP) to be supplied. The job mix formula shall indicate the source of the aggregates, grades of bituminous material and proportion of the crushed glass or crushed RACP to be used in the mix. The total amount of bituminous binder in the mix shall be between 4.0% to 6.0% for Asphalt Concrete Base. All test data used to develop the job mix formula shall also be submitted. The job mix formula for the mixture shall be in effect until modified in writing by the Project Manager. Should a change in sources of materials be made, a new job mix formula shall be established and approved before the new material is used.

All data for the control and the acceptance testing shall be submitted.

PART 2 – PRODUCTS

Asphalt concrete base shall consist of plant mix asphalt treated base or recycled treated base as specified below.

2.01 MATERIALS

A. Plant Mix Asphalt Treated Base

Plant Mix Asphalt Treated Base shall conform to Section 32 of the Standard Specifications, except as modified by the following paragraphs:

a) The asphalt cement grade shall be PG 64-16.

B. Recycled Asphalt Treated Base

The Recycled Asphalt Treated Base shall be a uniform mixture of crushed reclaimed asphalt concrete pavement (RACP), virgin aggregate, and asphalt cement.

1. The RACP shall be processed to provide a reasonably uniform gradation from fine to coarse with 100 percent of the material passing the 1-1/2 inch sieve.

   The blend of virgin aggregate and crushed RACP shall produce a combined mixture of acceptable gradation.

2. The proportion of RACP to virgin aggregate shall not exceed 30% crushed RACP to 70% virgin aggregate by weight.

   Once established, the proportion of virgin aggregate to crushed RACP shall not be changed without the approval of the Project Manager.

3. No job tolerances will be established for the Asphalt Concrete Base with crushed glass or crushed RACP mixture; however, once the job mix is established, the Contractor shall maintain controls to produce a uniform product as established in the job mix.

2.02 MIX DESIGN

The bituminous mixtures shall be designed using procedures contained in Chapter III, Marshall Method of Mix Design, of the Asphalt Institute's Manual Series No. 2 (MS-2), current edition, and shall meet the requirements of Table I below:

TABLE I REQUIREMENTS FOR MARSHALL METHOD OF MIX DESIGN

Test Property	Asphalt Treated Base
Number of Blows	75
Stability, lb. (minimum number)	2,000
Flow, 0.01 in.	8 -16
Percent air voids	3-8
Percent air voids in mineral aggregate (min.)	13

PART 3- EXECUTION

3.01 CONSTRUCTION REQUIREMENTS

The compacted mixtures of the in place pavement shall not be less than 91 percent of the specific gravity (ASTM D 2041, commonly called the Rice Method) of the combined mixture without voids.

The Contractor shall provide laboratory testing for control and acceptance

functions during periods of mix productions: One (1) field Marshall Test, asphalt content test, gradation analysis, and specific gravity test for each mixture.

3.02 ACCEPTANCE SAMPLING AND TESTING OF THE BITUMINOUS MIXTURE

Two (2) core Samples Per Street or one core per repaved trench if repaving is less than one traffic lane in width, for the determination of the thickness and density of the completed pavements (or using nuclear gauge for determination of density) shall be obtained and/or tested by the Contractor at no extra cost (including that to restore the affected area). The size, number, and locations of the samples and testing will be directed by the Project Manager.

Tests necessary to determine the conformance with requirements shall be performed by the Contractor.

END OF SECTION

SECTION 02830 - DRIP PANS

PART 1 - GENERAL

The Contractor shall place drip pans or approved absorbent material under all paving equipment during all non-working hours.

The Contractor shall be fully responsible for all Contractor-related damages due to lack of placement of drip pan(s) or approved absorbent material under paving equipment during non-working hours, which results in any type of petroleum or any other environmentally hazardous spill. The Contractor shall be fully responsible for all clean-up or billed for the actual cost of clean-up by the DHHL. Any subsequent fines imposed upon the DHHL by the Environmental Protection Agency (EPA) and/or State Department of Health will be back charged to the Contractor.

PART 2 – PRODUCTS (Not used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 02840 - PAVEMENT MARKERS, STRIPING AND MARKINGS

PART 1 – GENERAL

1.01 DESCRIPTION

This work shall consist of furnishing all labor, materials and equipment, and installing complete in place pavement markers, reflectorized white and yellow traffic pavement striping and other markings in conformance to the "Manual on Uniform Traffic Control Devices for Streets and Highways", 2003 Edition (MUTCD), the "Traffic Standards Manual" of the Department of Transportation Services, July 1976 and these plans and specifications. This work shall also include the removing of existing pavement markers and removing or eradicating existing pavement striping and markings when called for in the plans and/or ordered by the Project Manager.

The Contractor shall be responsible for field verifying all existing striping, pavement markings, and pavement markers and bringing any discrepancies to the Project Manager's attention. The Contractor shall restore all striping, pavement markings, and pavement markers as shown on the plans upon resurfacing the roadway.

1.02 SUBMITTALS

Submit samples of the markers and adhesives proposed for use to the Project Manager, for testing and review, at least 10 calendar days before the date of their intended use.

A. Marker Certification: The Contractor shall submit to Project Manager a certificate of compliance and certified test results indicating that all types of markers conform to the specifications

B. Adhesive Certification: The Contractor shall submit to the Project Manager a certificate of compliance indicating that all types of adhesives conform to the requirements of the specifications.

C. The Contractor shall submit to the Project Manager test specimens as requested. Test films shall be applied to a suitable plane rigid surface. The area shall be of sufficient size to permit film thickness measurement to be made at least one (1) inch from any edge.

D. Specimens shall be prepared and tested from the samples submitted in accordance with ASTM D 620-57T, "Tentative Method of Test for Colorfastness of Plastics".

PART 2 – PRODUCTS

2.01 MATERIALS

Materials shall conform to the requirements of Pavement Markers and Adhesive for

Pavement Markers as specified in these specifications.

A. Qualification of Reflectorized Traffic Paint for Temporary Markings. Only those traffic paints which have qualified in the latest completed prequalification tests conducted by the State Department of Transportation and having a Weighted Rating (W) of at least 6.5 for reflectorized white and 7.0 for reflectorized yellow at the completion of the road test will be permitted for use on this project. Quick dry paints shall not be used.

The Contractor may use materials designed for pavement striping, such as adhesive striping, on temporary detours with the acceptance of the Project Manager. Such materials shall meet the color and reflection requirements for traffic paints.

B. Description of Markers. The markers shall have the shape, dimensions and tolerances as shown on the plans. The markers shall be of uniform composition and free from surface irregularities, cracks, checks, chipping and other physical damage interfering with appearance or application.

C. Type of Markers.

1) Type A - Non-Reflective White Markers and Type J Non-Reflective Yellow Markers.

Class III Ceramic Type. For use on Portland cement concrete and asphalt concrete road surfaces.

Class IV Ceramic Type. For use only on Portland cement concrete road surfaces.

The Class of non-reflective white marker to be used shall be at the option of the Contractor, subject to the above limitations.

2) Type B - Two-Way Clear Reflective Markers.

3) Type C - Red-Clear Reflective Markers.

4) Type D - Two-Way Yellow Reflective Markers.

5) Type E - Yellow-Clear Reflective Markers.

6) Type G - One-Way Clear Reflective Markers.

7) Type H - One-Way Yellow Reflective Markers.

8) Type DB – Two-Way Blue Reflective Markers.

2.02 MARKERS

A. Non-Reflective Markers. Type A and J pavement markers shall have the following characteristics:

1) Composition of Markers. The composition of finished markers shall conform to the following: The Class III and IV pavement markers shall consist of a heat-fired, vitreous, ceramic base and a heat-fired, opaque, glazed surface to produce the properties required in these specifications. The markers shall be produced from any suitable combination of intimately mixed clays, shales, talcs, flints, feldspars, or other inorganic material which shall meet the properties herein required. The markers shall be thoroughly and evenly matured and free from defects which affect appearance or serviceability.

2) Properties of Markers. The properties of finished markers, Class III and Class IV, shall conform to the following:

a) Finish. The top surface of the marker shall be convex and the radius of curvature shall be between 3-1/2 inches and 6 inches except that the radius of the 1/2 inch nearest the edge may be less. Any change in curvature shall be gradual. The top and sides shall be smooth and free of mold marks, pits, indentations, air bubbles, or other objectionable marks or discolorations.

The bottoms of the ceramic markers shall be free from gloss or glaze and shall have a number of integrally formed protrusions approximately 0.050 inch projecting from the surface in a uniform pattern of parallel rows.

Each protrusion shall have a face parallel to the bottom of the marker. The area of each parallel face shall be between 0.01 and 0.065 square inches and the combined area of these faces shall be between 2.2 and 4.4 square inches.

The protrusions shall be circular in section. The number of protrusions should be not less than 48 nor more than 200.

To facilitate forming and mold release, the sides of each protrusion may be tapered. This taper shall not exceed 15 degrees from perpendicular to the marker bottom. Markers manufactured with protrusions whose diameter is less than 0.15 inch may have an additional taper not exceeding 30 degrees from perpendicular to the marker bottom and extending not more than one-half the total height of the protrusion.

The overall height of the marker shall be between 0.68 to 0.80 inch.

b) Glaze Thickness. The thickness of the glazed surface shall be not less than 0.007 inch at any point located more than 1/4 inch from the edge of the marker circumference. The glaze thickness shall be measured on a fractured edge with a calibrated reticle of a microscope of at least 25 power.

c) Moh Hardness. The glazed surface of the marker shall have a hardness of a 6 minimum in the Moh hardness scale. This shall be determined relative to the mineral orthoclase which has a hardness of 6. With moderate hand pressure, it must be possible to scratch orthoclase with the marker but not possible to scratch the marker with the orthoclase.

d) Directional Reflectance (Type A markers only). The 45°, 0 ° directional reflectance of the marker when tested in accordance with ASTM E 97, shall have the following values:

Glazed Surface	75 minimum
Body of Marker	65 minimum

The test on the glazed surface shall be made on the top of the convex surface of the marker. The test on the body of the marker shall be made on a flat surface of the marker from which the glaze has been removed by grinding with carborundum wheel.

e) Yellowness Index (Type A markers only). The yellowness index of the marker when tested in accordance with ASTM E 313 shall have the following values:

Glazed Surface	0.07 maximum
Body of Marker	0.12 maximum

The test on the glazed surface shall be made on the top of the convex surface of the marker. The test on the body of the marker shall be made on a flat surface of the marker from which the glaze has been removed by grinding with a carborundum wheel.

f) Color (Type J markers only). The chromaticity of the glazed surface of the marker shall be within the following limits:

Purity	76 to 96 percent
Dominant Wave Length	579 to 585 mu

Total Luminous Reflectance (Y value)	0.41 minimum

Chromaticity measurements shall be made in accordance with California Test Method No. 660.

g) Water Absorption. The average water absorption of the ceramic marker when tested in accordance with ASTM C 373 shall not exceed 2.0 percent of the dry weight of the test piece.

h) Autoclave Test. The glazed surface of the marker shall not craze, spall or peel when subjected to one cycle at 100 psi for one hour of the autoclave test when tested in accordance with ASTM C 424.

i) Strength Test. A random sample of 5 markers of each type and/or class used will be selected for the load test. Each Class III marker shall support a minimum load of 1500 pounds and each Class IV marker shall support a minimum load of 750 pounds when the load is applied in the following manner: The base of the marker shall be made flat using plaster of paris or some other suitable material. Sufficient amount of material shall be applied to the base of the marker to fill the spaces around the protrusions up to the faces of the protrusions. The protrusions shall not protrude from the prepared finished base. The prepared marker shall be centered, base down, over the open end of a vertically positioned hollow metal cylinder. The cylinder shall be one inch high, with an internal diameter of 3 inches and a wall thickness of 1/4 inch. A load necessary to break the marker shall be applied at a speed of 0.2 inch per minute to the top of the marker through a one inch diameter solid metal cylinder centered on the top of the marker. Failure shall consist of a breakage of the marker at a load of less than 1500 pounds when applied to Class III markers or less than 750 pounds when applied to Class IV markers.

j) Sampling. Twenty markers selected at random will constitute a representative sample for each batch consisting of 10,000 markers or less. Forty markers will constitute a representative sample for lots consisting of more than 10,000 markers. The lot size shall not exceed 25,000 markers. However, if a batch represents less than 100 markers, the Project Manager may delete sampling and may accept the markers based on certification of compliance and certified test results.

k) Tolerances.

i. Three test specimens shall be randomly selected from the

sample for each test except as noted in (i) above, and tested for compliance in accordance with these specifications. Should any one of the specimens fail to comply with the requirements of these specifications, additional samples consisting of double the number of samples originally taken will be tested. The failure of any one of these additional samples shall be cause for rejection of the entire lot or shipment represented by the sample.

ii. At the discretion of the Project Manager, a resample may be taken consisting of double the number of samples originally taken. Tolerances for resamples shall be in the same ratio as specified above.

l) Packaging. Shipments shall be made in containers which are acceptable to common carriers and packaged in such a manner as to insure delivery in perfect condition. Any damaged shipments shall be replaced by the Contractor. Each package shall be clearly marked as to the name of the manufacturer, type, color, quantity enclosed, lot and/or batch number, and date of manufacture.

B. Reflective Pavement Markers. Reflective pavement markers shall be of the prismatic reflector type consisting of a methyl methacrylate or suitably compounded acrylonitrile butadiene styrene (ABS) shell filled with a mixture of an inert thermosetting compound and filler material. The exterior surface of the shell shall be smooth and contain one or two methyl methacrylate prismatic reflector faces of the color specified.

The reflective lens shall not contain any voids or air space and the back of the lens shall be metallized.

The shell shall be fabricated in a manner that will provide a mechanical interlock between the thermosetting compound and the shell. The thermosetting compound shall bond directly to the backside of the metallized lens surface.

The base of the marker shall be flat (the deviation from a flat surface shall not exceed 0.050 inch), rough textured and free from gloss or substances which may reduce its bond to the adhesive. The presence of a soft or resin-rich film on the surface of the base will be cause for rejection.

Reflective markers shall conform to the following requirements:

1) Optical Performance. The specific intensity of each reflective surface, when tested at 0.2 degrees angle of divergence, shall not be less than the following specified values:

	Specific Intensity			
	Clear	Yellow	Red	Blue
0° Incidence Angle	3.0	1.5	0.75	-
20° Incidence Angle	1.2	0.60	0.30	-

NOTE:

a) Angle of Incidence. The angle formed by a ray from the light source to the marker and the normal to the leading edge of the marker face.

b) Angle of Divergence. The angle formed by a ray from the light source to the marker and the returned ray from the marker to the measuring receptor.

c) Specific Intensity. The mean candle power of the reflected light at a given incidence and divergence angle for each foot candle at the reflector on a plane perpendicular to the incidence light.

$$SI = \frac{(R_L)(D^2)}{I_L}$$

Where: SI = Specific Intensity
R_L = Reflected Light
I_L = Incident Light
D = Test Distance

d) Test Method. The markers to be tested shall be located with the center of the reflecting face at a distance of 5 feet from a uniformly bright light source having an effective diameter of 0.2 inch. The photocell receptor width shall be 0.05 inch and shall be shielded to eliminate stray light. The distance from the center of the light source aperture to the center of the photocell shall be 0.21 inch. If a test distance of other than 5 feet is used, the source and receptor shall be modified in the same proportion as the test distance.

2) Color. The color of the reflectors when illuminated by an automobile headlight shall be clear, yellow, red, or blue color as required. Off-color reflection will constitute grounds for rejection.

3) Strength Requirements. A random sample of 3 markers shall be selected for the load test. The marker shall support a minimum load of 2,000 pounds as applied in the following manner: The marker shall be centered,

base down, over the open end of a vertically positioned hollow metal cylinder. The cylinder shall be one inch high, with an internal diameter of 3 inches and a wall thickness of 1/4 inch. A load necessary to break the marker shall be applied at a speed of 0.2 inch per minute to the top of the marker through a one-inch diameter solid metal cylinder centered on the top of the marker. Failure shall consist of either:

a) breakage or significant deformation of the marker at load of less than 2,000 pounds, or

b) significant delamination of the shell and the filler material regardless of the load required to break the marker.

4) Sampling. Six markers will be selected at random from each batch for testing. However, if a batch represents less than 100 markers, the Project Manager may delete sampling and may accept the markers based on certification of compliance and certified test results.

5) Tolerances. Should any one of the samples selected for strength testing fail to comply with the strength requirements of these specifications, six (6) additional samples will be tested. The failure of any of these additional six (6) samples will be cause for rejection of the entire lot or shipment represented by the samples.

6) Packaging. Shipments shall be made in containers which are acceptable to common carriers and packaged in such a manner as to insure delivery in perfect condition. Any damaged shipments shall be replaced by the Contractor. Each package shall be clearly marked as to the name of the manufacturer, color, type, lot number, quantity enclosed, and date of manufacture.

7) The Contractor shall use Type DB reflective markers to show fire hydrant locations. The markers shall measure 4 inches by 4 inches (+ ½") and have a minimum area exposed to traffic of 12.5 square inches. Maximum slope of the reflective faces shall not be more than 30° nor less than 27° from the horizontal.

The lens shall be a brilliant blue color and be a true cube-corner type reflex reflector molded of optic grade methyl methacrylate (plastic).

The shell shall be white, molded of high impact acrylonitrile butadiene styrene (ABS).

2.03 ADHESIVE FOR PAVEMENT MARKERS

Epoxy adhesive or bituminous adhesive shall be used in accordance with this

specification. Certificate of compliance and certified test results shall be submitted for pavement marker adhesives.

A. Epoxy Adhesive

All adhesives shall have a white A epoxy component and a black B curing agent component, each packaged separately. The mixing ratio of Component A to Component B shall be one-to-one by volume. The color of the material when mixed shall be approximately that of Color Nos. 26132 to 21652 of Federal Standard No. 595-A. The Standard Set Type is a compositional specification, together with test requirements. The Rapid Set type is based on laboratory test requirements only. No volatile solvents or thinners shall be present in the epoxy adhesives.

B. Requirements. The adhesive shall have the following properties:

1) Pot Life. The pot life shall be 12 minutes maximum and 7 minutes minimum for Standard Set Type and 5 minutes minimum for Rapid Set Type when tested as follows at 77°F ±3°F: Mix equal volumes of components A and B in an 8-ounce, unwaxed paper cup 2 inches ±1/4 inch at base to give a 170 grams ±10 grams total mass. Mix 60 seconds ±5 seconds before timing for pot life. Test with a tongue depressor with minimum stirring. Record the time the material becomes unusable as the pot life. With most materials this shall be approximately the time a hard lump forms in the center.

2) Shear Strength. When tested as follows, the shear strength shall be not less than 1,000 psi for Standard Set Type and 900 psi for Rapid Set Type.

Bond three concrete blocks 2 inch x 3-1/2 inch x 7 inch of 7-sack concrete together with the 7-inch sides parallel forming 2 areas of contact 3-1/2 inch x 3-1/2 inch by overlapping the blocks. The test specimen then has a base of 2 blocks and a second surface formed by the center block. Apply the adhesive to the contact surfaces and allow to cure for 24 hours at 77°F ±3°F. Cap the base of the specimen with capping compound and test at a load rate of 10,000 pounds per minute. A swivel type head must be used at the top of the testing press. Computations are based on a total area of 24.5 square inches (shear strength = total load/24.5).

3) Viscosity. The viscosity of each component when measured in a 3/4 filled standard round quart paint can shall be between 1.0 x 105 and 3.0 x 105 centipoises for Standard Set Type and 0.8 x 105 and 2.2 x 105 centipoises for Rapid Set Type when measured as follows: Stir the components vigorously for 30 seconds with a spatula. Remove entrained air by vigorously tamping and measure viscosity within 10 minutes after stirring. Use Brookfield Viscometer, Model RVT, or approved substitute, at 5.0

RPM with a Model C Brookfield Helipath Stand and Helipath TD Spindle, or approved substitute, having a crossarm length of 0.804 inches for Standard Set Type and T.E. Spindle for Rapid Set Type. Use weight included in spindle set. Component and ambient temperature is to be 77°F ±3°F at time of measurement. Reading shall be taken at approximately the center of the vertical travel of the spindle.

4) Viscosity--Shear Ratio.

$$\frac{\text{Viscosity at 0.5 RPM}}{\text{Viscosity at 2.5 RPM}}$$

This ratio shall be 2.0 minimum for Standard Set Type and 1.8 minimum for Rapid Set Type for Component A and 1.9 minimum for Component B. Take the above viscosities at the same time and conditions as in Subsection 3 above.

5) Bond Strength.

a) Clean a 4 inch x 4 inch area on a flat surface of a concrete block made with 7-sack concrete and having a tensile strength in excess of 250 psi.

b) Use the equipment and load described in Calif. Test Method No. 420. Condition test equipment, concrete and epoxy at test temperature for 24 hours before test.

c) Mix adhesive on a tin plate with a trowel or spatula for 60 seconds ±5 seconds. Immediately start timing, place adhesive on pipe cap and press firmly in place on concrete. Just before the required test time, insert the dynamometer hook into pipe cap.

d) After curing 3-1/3 hours for Standard Set Type and 25 minutes for Rapid Set Type at 77°F ±3°F measured from the end of the mixing period, the bond strength shall be at least 200 psi.

6) Weight Per Gallon, Pounds at 77°F ±3°F (Standard Set Type).

Component A	11.5 - 11.8
Component B	11.7 - 12.1

Composition:

STANDARD SET TYPE

Component A	Parts by Weight
Epoxy Resin[1]	100.0
Titanium Dioxide, TT-P-422, Type III or IV	7.31
Resin Grade Asbestos[2]	5.00
Talc[3]	37.64

Component B	Parts by Weight
N-Aminoethyl piperazine[1]	23.16
Nonylphenol[5]	52.00
Carbon Black, TT-P-343, Form 1, Class B	0.22
Talc[3]	77.37
Resin Grade Asbestos[2]	1.00

[1]Viscosity, 5-7 poises at 25°C; epoxide equivalent 175-195; Color (Gardner), 5 maximum; manufactured from epichlorohydrin and bisphenol A. The reactive diluent shall be butyl glycidyl ether.

[2]Specific gravity, grams per ml., 2.45; moisture content, % by weight, 2.0 maximum; surface area, square meters per gram, 60 approximately; reflectance, G.E. brightness, 72-76; nature of surface charge, electropositive (cationic); pH in water, 9.5; bulking value, gallons per 100 lbs., 4.8; oil absorption (DOP), pound per 100 lbs., 120; refractive index, and 25°C., 1.54-1.56; wet bulk density in water, after dispersion, 2 grams per liter, settling after 1 hr., 100 ml. clear maximum; dry bulk density, pounds per cubic foot,

[3]Percent passing U.S. No. 325 sieve, 94-96; maximum particle size, 70 microns, oil absorption (Gardner-Coleman), 6-7 ml. per 20 grams; fineness in oil (Hegman) 1-2; specific surface, 0.5-0.6 square meter per gram; consistency (40% suspension in linseed oil) 55-60 KU.

[4]Color (ALPHA) 50 maximum; amine value 1250-1350 based on titration which reacts with the 3 nitrogens in the molecule; appearance clear and substantially free of suspended matter.

[5]Color (ALPHA) 50 maximum; hydroxyl number 245-255; distillation range, °C. at 760 mm first drop 295 minimum, 5% 298 minimum, 95% 325 maximum; water, % (K.F.) 0.05 maximum.

Directions for use:

Any settling of fillers or pigments in Components A or B shall be completely redispersed to provide a homogeneous mix before the components are used. Just before use, Components A and B shall be mixed in a one-to-one ratio by volume.

When the Rapid Set Type adhesive is used, the components shall be mixed by a 2-component type automatic mixing and extrusion apparatus. The temperature of the Rapid Set Type adhesive shall be maintained at 65°F. to 85°F. before mixing. The temperature of the Standard Set Type adhesive shall be maintained at 60°F. to 100°F. before mixing. Any heating of epoxy adhesive shall be done by the application of indirect heat.

Packaging and Labeling of Adhesive. Each adhesive component shall be packaged in containers not larger than 5 gallons in volume. The containers shall be new steel, not less than No. 24 gage and shall otherwise meet Interstate Commerce shipping standards. Each container shall be clearly labeled with designation (Component A or B), type (Standard or Rapid Set), manufacturer's name, date of manufacturer, batch number (a batch shall consist of a single charge of all components in a mixing chamber), directions for mixing, and the following warning:

CAUTION

> This material will cause severe dermatitis if it is allowed to come in contact with the skin or eyes. Use gloves and protective creams on the hands. Should this material contact the skin, wash thoroughly with soap and water. Do not attempt to remove this material from the skin with solvents. If any gets in the eyes, flush for 10 minutes with water and secure immediate medical attention.

Sampling. One quart sample of each of the components (A and B) from each batch will be sampled for testing.

C. Bituminous Adhesive

Bituminous adhesive shall conform to the following requirements:

1) Properties and Test Methods

BITUMINOUS ADHESIVE PROPERTIES AND TEST METHODS			
Property	Min	Max	Test Method
Softening Point, degrees F	200	-	ASTM D 36
Penetration, mm, 100g, 5 sec., 77 degrees F	1.0	2.0	ASTM D 5
Filler Content, percent by weight (Insoluble in 1, 1, 1 Trichloroethane)	65	75	ASTM D 2371
Brookfield Thermosel Viscosity, centipoise, No. 27 Spindle, 20 RPM, 400 degrees F	3000	6000	ASTM D 4402
Flash Point, C.O.C., degrees F	550	-	ASTM D 92

2) Filler Properties. Filler material used in bituminous adhesive shall be Type PC, Grade III, calcium carbonate conforming to ASTM D 1199, and shall conform to fineness specified in the Bituminous Adhesive Filler Fineness table.

BITUMINOUS ADHESIVE FILLER FINENESS

Sieve Sizes	Percent Passing
No. 100	100
No. 200	95
No. 325	75

3) Packaging and Labeling. Adhesive shall be packaged in self-releasing, stacking, cardboard containers, approximately 10-inch cubes. Containers shall have net weight of about 62 pounds. Containers shall be labeled with manufacturer, quantity, and batch number. Words “Bituminous Adhesive for Pavement Markers” shall be printed in bold lettering on label.

2.04 REFLECTIVE THERMOPLASTIC COMPOUND PAVEMENT MARKINGS

A. General. Reflective thermoplastic compound pavement markings shall be a substance, free of volatiles, which is machine applied to the pavement surface in a hot molten state and which, after cooling to the ambient temperature, and without polymerization or other chemical change, forms a traffic marking stripe of the quality and appearance as specified herein.

The material used shall be an alkyd type product especially compounded for traffic markings.

The installed stripe shall not be slippery when wet.

The compound shall not deteriorate by contact with sodium chloride, calcium chloride, oil content of pavement materials, or from oil droppings from traffic.

In the plastic state, the material shall not give off fumes which are toxic or otherwise injurious to persons or property. The material shall not break down or deteriorate if held at the plastic temperature for a period of four hours, or by reason of 4 reheatings to the plastic temperature.

There shall be no obvious change in color of the material as a result of up to 4 reheatings, or from batch to batch.

To insure the best possible adhesion, the compound shall be installed in a melted state of a minimum temperature of 375°F, and the material shall not scorch or discolor if kept at temperatures between 380° to 450° Fahrenheit for up to 4 hours.

The pigmented binder shall be well dispersed and free from all skins, dirt, foreign objects, or such ingredients as will cause bleeding, staining, or discoloration.

After application and proper drying time, the material shall show no appreciable deformation or discoloration under local traffic conditions, and in an air and/or road temperature ranging from 0 to 120° Fahrenheit.

Under this specification, the term "drying time" shall be defined as the minimum elapsed time, after application, when the stripe shall have and retain the characteristics required by the preceding sections. In addition, the drying time shall be established by the minimum elapsed time after application, after which normal local traffic will leave no impression or imprint on the applied marking.

The drying time shall not exceed a characteristic straight line curve, the lower limits of which are 2 minutes at 50°F, the upper limits of which are 15 minutes of 90°F, both temperatures measured at a maximum relative humidity of 70 percent.

The stripe shall maintain its original dimensions and placement. The exposed surface shall be free from tack. Cold ductility of the material shall be such as to permit normal movement with the road surface without chipping.

The marking shall have a uniform cross section. Pigment shall be evenly dispersed throughout the material. The density and character of the material shall be uniform throughout its thickness.

The material shall not smear or spread under normal traffic conditions at temperatures below 120°F.

The filler to be incorporated with the resins or binders shall be a white calcium carbonate or approved substitute filler.

The white thermoplastic shall have a pigment containing not less than 6 percent of Titanium Dioxide, and, after setting, shall be pure white, free from dirt or tint.

Yellow reflectorized thermoplastic compound shall be "Federal Yellow".

The binder shall consist of a mixture of non-drying synthetic resins at least one of which is solid at room temperature. The total binder content of the thermoplastic compound shall be not less than 15 percent nor more than 35 percent by weight.

The material shall not change in its color and brightness characteristics after prolonged exposure to sunlight.

During manufacture, reflectorizing beads shall be mixed into the material to the extent of not less than 20 percent nor more than 50 percent by weight of the material. The beads that are applied to the surface of the material shall be automatically applied at a uniform rate of approximately 3 pounds of glass beads to every 100 square feet of line.

The glass beads used in the formulation shall have a refractive index of not less than 1.51 when tested by the liquid immersion method at 25°C; shall consist of 70 percent min. by count of true spheres; shall be free from air inclusions; and shall have the following graduation:

U. S. Sieve Number	Percent Passing
30	90 - 100
40	35 - 100
100	0 - 10

Not less than 70 percent of the spheres shall meet the following requirements:

1) The surface of the spheres shall be smooth, lustrous, and free from film scratch and pits.

2) The spheres shall be clear and transparent and shall not be oviate in shape or fused spheroids.

3) The spheres shall show high autocollimating efficiency. Not more than one percent shall be black, amber, or milky.

The glass beads dropped on the applied marking shall have a refractive index of not less than 1.51 when tested by the liquid immersion method of 25°C., shall consist of 70 percent min. by count of true spheres; shall be free from air inclusion; and shall have the following gradation:

U. S. Sieve Number	Percent Passing
20	90 - 100
80	0 - 10

Not less than 70 percent of the spheres shall meet the following requirements:

1) The surface of the spheres shall be smooth, lustrous, and free from film scratch and pits.

2) The spheres shall be clear and transparent and shall not be oviate in shape or fused spheroids.

3) The spheres shall show high autocollimating efficiency. Not more than one percent shall be black, amber, or milky.

B. Specifications and Tests.

1) Color

a) White. Initially white; as demonstrated by a standard color difference meter such as the Gardner Color Difference Meter manufactured by Gardner Laboratories, Inc., Bethesda, Maryland, the material shall show deviations from a magnesium oxide standard not greater than the following:

Scale Definition	Mag. Oxide Standardized Sample	
Rd Reflectance	100	70 minimum
a Redness-Greenness	0	-5 to +5
b Yellowness-Blueness	0	-10 to +10

b) Yellow. Initially yellow; equal to standard color chips using Federal test method standard 141 Method 4252.

2) Color Retention. The retention of the initial color shall be determined as follows: Specimens shall be prepared and tested from the samples submitted in accordance with ASTM D 620-57T, "Tentative Method of Test for Colorfastness of Plastics". The ultraviolet light source shall be as specified from the test procedure or optionally may be a General Electric 275 watt sun lamp bulb, type RS, with built-in reflector. After 100 hours of exposure, specimens shall show no perceptible color change when compared visually with an unexposed specimen.

3) Water Absorption. Material shall have not more than 0.5 percent by weight of retained water, when tested by ASTM D 570, procedure a.

4) Softening Point. Material shall have a softening point of not less than 90°C, as determined by ASTM E 28.

5) Specific Gravity. Specific gravity of compound at 25°C. shall be from 1.9 to 2.5.

6) Impact Resistance. The impact resistance shall not be less than 15 inch-pounds at 77°F. after the material has been heated for 4 hours at 400°F. and cast into bars of one-inch cross sectional area and three inches long and placed with one-inch extending above the vise in a cantilever beam (Izod Type) tester using the 25-inch pound scale. See ASTM D 256 for description of this instrument.

7) Bond Strength. When 2 concrete blocks 2 inches by 3-1/2 inches by 7 inches are cemented together on the 3-1/2-inch by 7-inch faces with a 1/16 to 1/8-inch layer of the thermoplastic traffic line material and tested according to ASTM C 321, the bond strength shall not be less than 150 pounds square inch.

8) Indentation Resistance. The reading of the Shore Durometer, Type A, as described in ASTM D 2240 after 15 seconds shall not be less than the amounts herein designated when the material is tested after heating for 4 hours at 400°F., and cooled to the following temperatures:

Temperature	Reading
115°F.	65
77°F.	95

40°F.	95

C. Packaging. Each unit container shall be clearly and adequately marked to indicate the color of the material, the process batch number or similar manufacturer's identification, the manufacturer's name and location of plant, and the date of manufacturer.

The material shall be delivered to a designated area in unit containers as processed by the manufacturer. Each unit container when filled shall weigh no less than 24 lbs. or more than 52 lbs.

D. Warranty. Thermoplastic compound pavement marking material furnished and installed under this specification shall be guaranteed by the Contractor against failure due to poor adhesion resulting from defective materials or methods of application.

For pavements carrying 30,000 vehicles per day or less, the successful Offeror shall guarantee to replace, without cost to the DHHL, that part of the pavement markings installed under this contract which, in the opinion of the Project Manager, has not remained to perform useful service as follows:

1) Crosswalks and stop lines:

90 percent of the total of any one intersection for one year.

75 percent of the total of any one intersection for 2 years.

50 percent of the total of any one intersection for less than 3 years.

2) Lane Lines, Edge Lines, and Center Lines:

90 percent of a unit for one year.
80 percent of a unit for 2 years.
60 percent of a unit for 3 years.

(A "Unit" is defined as any length of highway having installed thereon 2,000 lineal feet of line of specified width in any combination or pattern.)

The replacement material installed under this guarantee shall be guaranteed the same as the original material, from the date of the original installation.

E. Equipment. The material shall be applied to the pavement by an extrusion method wherein one side of the shaping die is the pavement and the other 3 sides are part of the equipment.

The equipment shall provide continuous mixing and agitation of the material. Conveying parts of the equipment shall be constructed to pavement accumulation and clogging. All parts of the equipment which come in contact with the material shall be easily accessible and exposable for cleaning and maintenance.

All mixing and conveying parts including the shaping die shall maintain the material at the plastic temperature.

The equipment shall assure continuous uniformity in the dimensions of the stripe. The thickness of the material on the pavement shall be no less than 3/32 inch and no more than 3/16 inch measured as an average in any three foot length.

The applicator shall cleanly cut off square stripe ends and shall be capable of applying "skip" lines. The use of pans, aprons or similar appliances which the die overruns will not be permitted.

Beads applied to the surface of the completed stripe shall be applied by an automatic bead dispenser attached to the liner in such a manner that the beads are dispensed almost instantly upon the completed line. The bead dispenser shall be equipped with an automatic cutoff control synchronized with the cutoff of the thermoplastic material.

The equipment shall be constructed to provide for varying die widths to produce varying widths of traffic markings.

A special kettle shall be provided for melting and heating the composition. The kettle shall be equipped with an automatic thermostatic control device so that heating can be done by controlled heat transfer liquid rather than direct flame, to provide positive temperature control and prevent overheating of the composition.

The applicator and kettle must be equipped and arranged to satisfy the requirements of the National Fire Underwriters.

The applicator shall be mobile and maneuverable to the extent that straight lines can be followed and normal curves can be made in a true arc.

The applicator shall be capable of containing a minimum of 125 pounds of molten material.

F. Application. The Contractor shall clean off dirt, blaze, paint, tape and grease where necessary and as directed by the Project Manager.

The material may be installed in variable widths from 2 inches to 12 inches.

On pavements containing less than 6 percent bituminous asphalt and on all concrete pavements, the Contractor shall pre-stripe the application area with a

binder material as recommended by the manufacturer.

The compound shall be installed in a melted state at temperatures of 380° to 450° Fahrenheit.

The minimum installed thickness of the line as viewed from a lateral cross section shall be not less than 3/32nds of an inch at the edges, nor less than 1/8th of an inch in the center. The measures shall be taken as an average throughout any 36-inch section of the line.

The new line when applied over an old line of compatible material shall bond itself to the old line in such a manner that no splitting or separation takes place during its useful life.

The finished lines shall have well defined edges and be free of waviness.

PART 3 – EXECUTION

3.01 CONSTRUCTION REQUIREMENTS

A. General: Pavement markers and markings shall be applied to surfaces that have been thoroughly cleaned and are free of dirt, dust, curing compound, grease, oil, moisture, loose aggregates, unsound layers and any other material which would adversely affect the bond of the adhesive or paint.

In the installation of pavement markers, the cleaning of Portland cement concrete and asphalt concrete surfaces shall be by blast cleaning. Clean, newly placed asphalt concrete need not be blast cleaned unless the surface contains an abnormal amount of asphalt or the surface is contaminated with dirt, grease, oil or any other material which would adversely affect bonding.

Permanent pavement markers, striping and markings shall be applied no sooner than 7 calendar days nor later than 14 calendar days after completion of the pavement.

If bituminous adhesive is used, apply pavement markers not less than 7 days after completing pavement. If epoxy adhesive is used, apply markers not less than 14 days after completing pavement.

Unless otherwise specified, the Contractor shall establish control points, satisfactory to the Project Manager, spaced at intervals that will insure accurate location of pavement markers and striping. Markers and markings shall not be applied when moisture or foreign matter is present on the pavement surface or when wind conditions are such as to cause dust to be deposited on the prepared areas or to prevent satisfactory application of the marker adhesive or marking.

The Contractor shall paint temporary guidelines and outline of arrows, legends and crosswalks with a 2" wide brushed line on the day the roadway is opened to traffic which will be reviewed by the Project Manager before permanent lines are installed.

The Contractor shall furnish and place all warning and directional signs necessary to direct and control the traffic during marker installation or the striping operations. Warning signs shall be set up before the beginning of each operation and extra signs shall be kept well ahead of the marking equipment.

The Contractor shall install all markers and apply all pavement striping before opening roadways to public traffic except that when connections to existing pavements are made or when temporary detours carry public traffic, the Contractor shall mark or stripe the connecting pavements on the day that the roadway is open to traffic.

If the Contractor is unable to provide the permanent pavement markings and it is necessary to run public traffic over roadways soon after paving, the Contractor shall paint, on the day of each day's paving, temporary guide dashes at the traffic stripe or marker location on the pavement, as guidance for drivers, until the permanent markings can be placed. The Contractor shall maintain and repaint, if necessary, all temporary markings until the permanent striping and/or markers are installed. This work shall be considered as included to the items of paving, pavement markers and/or pavement striping, and no separate payment will be made therefor.

B. Pavement Markers: Use bituminous adhesive or standard set type epoxy adhesive to bond pavement markers to pavement. If ordered by the Project Manager, the Contractor shall use Rapid Set Type adhesive for the Standard Set Type adhesive at no extra cost to the DHHL.

Heat and dispense bituminous adhesive from equipment that can maintain required temperature.

The adhesive shall be placed uniformly on the cleaned pavement surface or on the bottom of the marker in a quantity sufficient to result in complete coverage of the area of contact of the marker with no voids present and with a slight excess after the marker has been pressed in place. The marker shall be placed in position and pressure applied until firm contact is made with the pavement. Excess adhesive around the edge of the marker, excess adhesive on the pavement, and adhesive on the exposed surfaces of the markers shall be immediately removed. Soft rags moistened with mineral spirits conforming to Federal Specification TT-T-291E or kerosene may be used, if necessary, to remove adhesive from exposed faces of pavement markers. No other solvent shall be used. The marker shall be protected against impact until the adhesive has hardened to the degree designated by the Project Manager.

The adhesive requires that the mixing operation and placing of the markers be done rapidly. When hand mixing or machine mixing the Standard Set Type adhesive, all markers shall be aligned and pressed into place within 5 minutes after mixing is started. When hand mixing Standard Set Type adhesive, not more than one quart shall be mixed at one time. Any mixed batch which becomes viscous so that the adhesive cannot be readily extruded from under the marker on application of slight pressure shall not be used.

When the Rapid Set Type adhesive is used, the components shall be mixed by a 2-component type automatic mixing and extrusion apparatus, the markers shall be placed within 60 seconds after the adhesive has been mixed and extruded and no further movement of the marker will be allowed.

Automatic mixing equipment for the epoxy adhesive shall use positive displacement pumps and shall properly meter the components in the specific ratio, ±5 percent by volume of either component. At the beginning of each day and at any other time ordered by the Project Manager, the ratio shall be checked by the Contractor in the presence of the Project Manager. This check shall be made by disconnecting the mixing heads, or using suitable bypass valves, and filling 2 suitable containers with the unmixed components. The mixing head shall properly mix 2 components so that there is no trace of black or white streaks in the mixed material.

The Standard Set Type adhesive shall not be used when either the pavement or the air temperature is less than 50°F. The Rapid Set Type adhesive shall not be used when either the pavement or the air temperature is less than 30°F. No markers shall be installed if the relative humidity of the air is greater than 80 percent or if the pavement is not surface dry. The Project Manager shall be the judge as to when the adhesive has set sufficiently to bear traffic. Where bituminous adhesive is used, protect marker against impact until adhesive has hardened to the degree designated by the Project Manager. Where epoxy adhesive is used, protect pavement markers against impact until adhesive has hardened, using the following table as a guide; however, the times shown may vary, depending upon field conditions:

	TIME TO BEAR TRAFFIC	
Temperature (°F)*	Standard Set Type (Hours)	Rapid Set Type (Minutes)
100	1-1/2	15
90	2	20
80	3	25
70	4	30
60	5	35
50	7	45
40	No Application	65
30	Below 50°F	85

No Application
Below 30°F

*The temperature indicated is either pavement surface or air temperature, whichever is lower. The hardness of the rim of epoxy around the marker shall not be used as an indication of the degree of cure of the epoxy under the marker.

Types A and J pavement markers that are used to delineate 10-foot lane stripes shall be installed in sets of four markers as called for on the plans. Installation of fractional sets (i.e., one, two or three markers) will not be permitted. The length of the 10-foot stripe and 30-foot gap may vary plus or minus one foot to properly distribute the spacing of stripes.

No pavement markers shall be installed over longitudinal or transverse joints of the pavement surface.

C. Pavement Striping and Markings: Pavement striping and markings shall be of the length, width and placement specified and shall conform to the Department of Transportation Services Standards.

Pavement arrows, legends, and crosswalks shall be applied with appropriate templates (refer to "Traffic Standards Manual" of the Department of Transportation Services, dated July 1976).

No stripe shall be less than the specified width. No stripe shall exceed the specified width by more than 1/2 inch. The length of the 10-foot marked or painted segment for skip stripe may vary plus or minus one foot and the 30-foot gap between segments may vary plus or minus one foot. The alignment of the stripe shall not deviate from the intended alignment by more than one inch on tangents and on curves up to and including one degree. On curves exceeding one degree, the alignment of the stripe shall not deviate from the intended alignment by more than 2 inches.

When necessary to correct a deviation which exceeds the permissible tolerance in alignment, that portion of the stripe so affected shall be removed plus an additional 30 feet in each direction, and a new stripe then provided in accordance with these specifications.

All stripes, segments of stripes and markings shall present a clean cut, uniform appearance. All striping and markings which fail to meet the requirements specified herein, or are marred or damaged by traffic or from other causes, shall be corrected prior to acceptance by the DHHL at the Contractor's expense. All misted areas, drip and spattered paint shall be removed to the satisfaction of the Project Manager.

The freshly painted temporary stripe shall be protected by cones or other satisfactory devices until the traffic paint is dry and will not transfer to car tires. All stripes damaged by traffic, or pavements marked by traffic crossing wet paint shall be repaired or corrected as specified below.

3.02 REMOVING EXISTING PAVEMENT MARKERS, STRIPING AND MARKINGS

Existing pavement markers shall be removed by methods that cause the least possible damage to the pavement or surfacing.

Where specified on the plans and/or ordered by the Project Manager, existing pavement striping and markings shall be removed to the fullest extent possible by methods that will not materially damage the surface or texture of the pavement, or leave impressions on the roadway that could be confused with permanent striping during inclement weather or night driving conditions. Any damage to the pavement or surfacing caused by the removal operations shall be repaired by the Contractor at his expense by methods acceptable to the Project Manager.

Painting over the existing striping and markings will not be permitted. Burning off existing striping and markings will be permitted using an acceptable method using excess oxygen.

Sand or other material deposited on the pavement as a result of removing pavement markers, traffic striping and markings shall be removed as the work progresses. Accumulation of sand or other material which may constitute a hazard to traffic will not be permitted.

Extraneous traffic striping and markings shall be removed before any change is made in the traffic pattern.

3.03 REMOVAL OF TEMPORARY TAPE TRAFFIC MARKINGS

The Contractor shall remove all temporary tape striping placed to delineate traffic lanes, crosswalks, stop bars, etc., prior to the lay down of the finish asphalt concrete mix layer.

END OF SECTION

SECTION 02950 – RESTORATION OF PROPERTY

PART 1 - GENERAL

This section shall be performed in conjunction with the requirements of the GENERAL CONDITIONS, STANDARD SPECIFICATIONS, and SPECIAL PROVISIONS Section 01050, "Examination of Site," Section 01120, "Access to and Protection of Property," Section 01505, "Prior Notice of Removal of Surface Encroachment," and Section 01770, "Pre and Post Construction Surveys", the SPECIAL CONDITIONS SC-21, "Pre-Construction/Post-Construction Site Crack and Photo Survey," and as shown on the Plans.

1.01 GENERAL

A. Unless otherwise specified in the Contract or directed by the Project Manager, the Contractor shall be responsible for the protection, repair, restoration, or replacement of all existing improvements that are affected by his construction operations.

B. Such protection, repair, restoration, or replacement work shall apply to all existing improvements located WITHIN or ADJACENT TO all right-of-ways, sewer easements, private properties, and all other work areas including field office and staging areas. Existing improvements shall include, but not be limited to, buildings, structures, trees, shrubbery, landscaping, lawns, walls, fences, utility lines, road surfaces, paved areas, driveways, curbs and gutters, sidewalks, and planting areas.

The work shall consist of restoring and/or maintaining existing improvements. Such work shall include, but not be limited to the following:

1. Repair of any pavement, slab, curb, gutter, sidewalk, driveway, guardrails, fences, buildings, structures, and walls damaged or removed during the course of construction, operation of excavation equipment and including damage to roads caused by haul trucks. All repairs and restorations to concrete, asphalt, tile or any other surface with aesthetic or construction joints shall be made from joint to joint.

2. Repair or replacement of utilities and fuel lines, damaged or removed during construction.

3. Repair or replacement of street lights, traffic signal cable and detector loops damaged or removed during construction.

4. Repairing and/or repainting any pavement markers and markings damaged or obliterated during construction work.

5. Removal of all equipment, materials and tools from the Contractor staging areas.

6. Replanting of all vegetation such as trees, hedges, shrubs and ground cover damaged or disturbed during construction. Damaged landscaped areas shall be restored with the same type of grass. Imported screened (1/2-inch screen) soil shall be used for replanting. The soil shall be fertile, friable, free of stones, noxious seeds, roots, sticks, weeds (especially nutgrass). Red Humic latosol soils or types known as "Palolo Clay" or "Lualualei Clay" are unacceptable.

7. Removal of all muck, spilled or splattered concrete, grout, and any other products used, and removal and/or repainting/refinishing to restore property and improvements that are stained or discolored as a result of products used by the Contractor.

1.02 Unless otherwise specified in the Contract or directed by the Project Manager, the Contractor shall repair, restore, or replace any affected existing improvement to the condition it was in prior to the start of construction, to the extent that such repair, restoration, or replacement is reasonably possible and to the satisfaction of the Project Manager. All repair, restoration, or replacement work shall be performed immediately, and prior to beginning work in another area of the project, unless otherwise directed by the Project Manager.

1.03 For surface encroachments (i.e. privately owned improvements, structures, plants, and shrubbery, etc.) within the public right-of-ways and sewer easements, the Contractor shall reference SECTION 01505, "Prior Notice of Removal of Surface Encroachment." The ground restoration after removal of surface encroachments shall be replanted with grass matching the existing surrounding area if such grass exists within five feet of the disturbed area.

1.04 NON-COMPLIANCE

Should the Contractor fail to comply with the requirements of this special provision or related requirements of the Contract, the Project Manager may withhold all progress payments and/or with or without notice to the Contractor, cause the work to be performed, and deduct the cost of such work from any moneys due the Contractor under this Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 03010 – CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.01 GENERAL

This special provision covers providing Portland cement concrete and reinforcing steel, in place complete and supplements Section 39, "Portland Cement Concrete" and Section 48, "Reinforcing Steel" of the STANDARD SPECIFICATIONS.

1.02 SUBMITTALS

Submittal information shall comply with the requirements of SPECIAL PROVISIONS Section 01300, “Submittal Procedures”. Contractor shall submit detailed information on his proposed procedures, equipment and materials to be used for sewer manhole construction for approval by the Project Manager within thirty (30) calendar days after the Notice to Proceed date. Design calculations and shop drawings shall be prepared and stamped by a Civil Engineer currently registered in the State of Hawai‘i. Physical properties of all materials shall be detailed. Additional information shall be provided as requested by the Project Manager. Submit the following as minimum to the Project Manager:

A. Submit four (4) copies of mix design for each class of concrete to be used including product data for all materials within mix.

B. Submit four (4) copies of reinforcing steel product data, placing diagrams and bar list.

C. Submit four (4) copies of manufacturer's certifications that all materials meet the standards stated herein and that required factory tests have been successfully performed.

D. Submit four (4) copies of mill certificates for all cement and reinforcing steel.

E. Submit four (4) copies of the 7-day and 28-day compressive strength test results within 14 calendar days of performing test.

PART – 2 PRODUCTS

2.01 MATERIALS

A. Portland Cement shall conform to ASTM C 150, Type II or modified Type I containing no more than 8 percent tri-calcium aluminate.

B. Reinforcing steel shall conform to ASTM A 615, Grade 60, except for stirrups and ties which shall be Grade 40 or 60, unless indicated otherwise on the drawings.

C. Aggregate shall be as specified in Section 39, "Portland Cement Concrete" of the STANDARD SPECIFICATIONS or as shown on the construction drawings.

D. Admixture shall be water reducing, set retarding type, ASTM C 494, Type D.

E. Non-shrink grout shall be Embecto 713, Kemox-G, Ferrolith-G, or approved substitute.

F. Premolded expansion joint material shall conform to ASTM D 1751 or ASTM D 994.

G. Joint sealing compound for slab joints shall conform to ASTM D 1854 and be compatible with premolded joint filler. Joint sealing compound for wall joint shall conform to Federal Specification TT-S-00227, Type II, Hardness 25-35.

H. Form release agents shall be of a type compatible with the waterproofing systems, protective coatings, and paint systems to be applied, or they shall be completely removed from concrete surfaces when forms are removed.

I. Curing compounds shall be water retaining membrane type conforming to ASTM C 309, Type I, compatible with the water proofing systems, protective coating and paint systems to be applied.

PART 3 – EXECUTION

3.01 PROCEDURES

A. No concrete work shall be started prior to approval by the Contractor of the product data, mix design and reinforcing steel placing diagrams by the Project Manager.

B. Concrete work shall conform to ACI 318-05 and the following sections of the Standard Specifications, as modified herein:

1) Section 39, Portland Cement Concrete
2) Section 40, Concrete Structures
3) Section 41, Concrete Curb and Gutter
4) Section 42, Concrete Sidewalk
5) Section 43, Concrete Block, Cradles and Jackets
6) Section 46, Reinforced Concrete Driveway Aprons
7) Section 48, Reinforcing Steel

C. Concrete shall be as specified on the Plans or in these Specifications.

D. Tremie concrete for work within open trenches shall be placed as shown on the Plans and as specified in STANDARD SPECIFICATIONS. The slump of the

concrete shall be at least 6 inches unless otherwise approved by the Project Manager. The water/cement ratio shall not exceed 0.60. The concrete mix shall flow easily in the tremie pipe and shall be designed to give a dense concrete when placed by the tremie method.

E. Tremie concrete used for mud slab groundwater cutoff shall be Class A.

F. Reinforcing steel shall be placed as detailed in the Plans and STANDARD DETAILS. Bar laps shall be as dimensioned. Placement of reinforcing steel shall be approved by the Project Manager before concrete is placed. Premolded joint filler shall be placed as shown and where required by the Standard Specifications. Joint sealant shall be applied to provide a neat, finished appearance, completely sealing in the joint filler.

G. Non-shrink grout shall be placed in accordance with the manufacturer's printed instructions. No grouting shall be done until the area and/or equipment to be grouted has been checked and approved by the Project Manager.

3.02 TESTING

A. The Contractor shall hire an approved third party testing company. The Contractor shall provide a minimum of eight (8) cylinders each for each pour under the direction of the Project Manager for each cast-in-place concrete structure and shall deliver the cylinders to the third party for testing. Test cylinders will be made and cured in accordance with ASTM C 31. Tests will be made in accordance with ASTM C 39. Molds required to make the concrete test cylinders shall be provided by the Contractor.

B. The test result shall be the average of the strengths of the cylinders. If this average falls below the strength specified, the mix design will be changed and/or cores will be taken and tested in accordance with ASTM C42 and/or the structure shall be removed and reconstructed, all at the Contractor's expense.

C. Section 5.6 of ACI-318-05 Code shall be adhered to in the evaluation and acceptance of concrete, except as noted above.

END OF SECTION

SECTION 03020 - REINFORCED CONCRETE JACKETS

PART 1 – GENERAL

1.01 GENERAL

This special provision shall supplement and modify Section 40, "Concrete Structures," and Section 43, "Concrete Blocks, Cradles and Jackets" of the STANDARD SPECIFICATIONS, and shall be applicable to reinforced concrete jackets for sewers.

1.02 SUBMITTALS

Refer to Section 03010, “Cast-in-Place Concrete” for the submittal requirements.

PART – 2 PRODUCTS

2.01 MATERIALS

Concrete and reinforcing steel for reinforced concrete jackets for sewer pipes shall be Class "A" and shall conform to the requirements of Section 39, "Portland Cement Concrete" and Section 48, "Reinforcing Steel", of the STANDARD SPECIFICATIONS, and SPECIAL PROVISIONS Section 03010, "Cast-in-Place Concrete."

PART 3 – EXECUTION

3.01 CONSTRUCTION DETAILS

A. Reinforced concrete jackets for sewer pipes shall be constructed in accordance with the STANDARD SPECIFICATIONS, these SPECIAL PROVISIONS, the jacket dimensions and reinforcing requirements shown in the STANDARD DETAILS (unless otherwise indicated in the PLANS), and the PLANS. Reinforced concrete jackets for sewer pipes larger than 12-inch shall be in accordance with the "Water System Standards," of the Board of Water Supply, City and County of Honolulu.

B. The concrete jacket shall begin and terminate at bell ends of the sewer pipe to facilitate replacement of the pipe out of the jacket, with a minimum 6 inch clearance from the nearest face of the concrete jacket to the nearest face of the crossing utility. The subgrade shall be able to bear the weight of the concrete jacket.

C. All frame work and reinforcing steel shall be inspected and approved by the Project Manager before the placement of any concrete. Forms shall be used for construction of concrete jacket in wide trench with crushed rock bedding backfill. Forms shall be removed.

END OF SECTION

SECTION 03030 - CONTROLLED LOW STRENGTH MATERIAL AND LIGHTWEIGHT CELLULAR CONCRETE

PART 1 – GENERAL

1.01 DESCRIPTION

The work of this section includes furnishing and placing Controlled Low Strength Material (CLSM) and Lightweight Cellular Concrete (LWCC) in utility trenches as bedding for pipelines and backfill in lieu of crushed rock, imported select borrow and onsite reusable soil (per geotechnical engineer's recommendation) to provide firm support for pipes, manholes and pavements, and to also facilitate construction. LWCC is being utilized to reduce soil loading and settlement potential. LWCC is also used for backfilling abandoned sewers, manholes and service laterals.

1.02 SUBMITIALS

A. Submit four (4) copies of 28-day compressive strength test results for all testing called for in these specifications.

B. Submit four (4) copies of the proposed mix design, manufacturer's certifications that all materials meet the standards stated herein and that required factory tests have been successfully performed, list of specialized equipment to be used for mixing and placement, and manufacturer's certification that the Contractor's personnel are adequately trained and sufficiently experienced to prepare and place the CLSM and LWCC.

PART 2 – PRODUCTS

2.01 MATERIALS

A. CLSM is a mixture of Portland cement, fine aggregate, and water. LWCC is similar to CLSM except it incorporates a foaming agent or other lightweight materials to reduce the unit weight of the fill material. Unless otherwise indicated, the Contractor shall proportion the CLSM and LWCC to produce a backfill material that is self-compacting and capable of being excavated later with hand tools.

B. The Contractor shall be responsible for the CLSM and LWCC mix design. The mix design of the CLSM and LWCC shall produce a uniform, flowable mixture that is essentially self-leveling when placed. No compaction is required.

C. CLSM and LWCC materials and mixes shall meet all applicable requirements generally accepted by the industry for such materials and products including, but not limited to, ASTM C796, ASTM C869, and ASTM C150.

D. CLSM shall have a 28-day compressive strength of 50 psi to 150 psi and have a wet unit weight sufficient enough to displace groundwater and achieve the required compressive strength. CLSM for pipe bedding shall be placed in completely dewatered excavations and trenches by methods such as a chute, hopper, trunk, or other method acceptable to the Project Manager. CLSM in the wet shall be pumpable and placed by tremie methods. CLSM mix shall be proportioned to prevent the tremie line from packing off. CLSM shall be placed in a manner to reduce segregation and changes in density. Prevent flotation of pipes, manholes and other structures during placement of CLSM in excavations and trenches. Damage due to hydrostatic pressure from the CLSM on pipes, manholes, and other structures will be the Contractor's responsibility and repaired at no additional cost to the DHHL.

E. LWCC shall be Class III and have a minimum 28-day compressive strength of 50 to 150 psi, and an in-place density of 65 to 85 pcf.

F. All materials shall conform to Section 39 - Portland Cement Concrete, Department of Public Works, City and County of Honolulu, Standard Specifications for Public Works Construction, September 1986.

G. Aggregates shall be from a source acceptable to the Project Manager and conform to STANDARD SPECIFICATIONS Subsection 39.2, "Materials for Fine Aggregate." The Contractor may use aggregates that are different from Subsection 39.2 subject to acceptance by the Project Manager. Aggregate shall stay in suspension in the CLSM and LWCC to the extent required for proper flow.

PART 3 – EXECUTION

3.01 CONSTRUCTION REQUIREMENTS

A. Thickness. Provide CLSM and LWCC as pipe bedding and pipe and manhole backfill as indicated on the Plans.

B. The CLSM and LWCC shall be mixed and placed in accordance with the approved mix design and the manufacturer's requirements. Provide sufficient mixing capacity to allow the material to be placed without interruption. Only equipment certified by the manufacturer as being allowable for use in mixing and placement shall be used by the Contractor.

C. CLSM and LWCC to be placed in the wet shall be done by tremie methods acceptable to the Project Manager. Before placing any CLSM and LWCC, thoroughly clean the trench or other bottom surface of soft materials and deposits that may cause the CLSM and LWCC to have differential settlements. Remove soft materials and deposits prior to placing CLSM and LWCC.

D. Placement. During placement operations around manholes and in pipe trenches, place the CLSM and LWCC evenly to avoid dislocating the piping or manholes due to fluid pressure from the flowable fill. Place in stages and/or provide sufficient anchors as necessary to prevent uplift. The Contractor shall comply with applicable requirements in SPECIAL PROVISIONS Section 02221, "Trench Excavation and Backfill". Unless otherwise indicated on the Plans and the SPECIAL PROVISIONS, CLSM and LWCC shall be placed only in excavations that have been completely dewatered. Do not place any CLSM and LWCC until after the Project Manager has inspected the area to be filled.

E. Pave or restore the pavement section no earlier than eight (8) hours after backfilling unless otherwise allowed by the Project Manager. Protect the backfill material from traffic during the period before restoration of the pavement section.

F. Testing and Quality Control. Two test specimens of CLSM used for pipe bedding shall be taken at the point of placement for every 200 feet of pipeline. Two test specimens of LWCC used for backfill shall be taken at the point of placement for every 200 feet of pipeline. Test specimens shall be tested for compressive strength in accordance ASTM C39. Test specimens shall be weighed and the unit weight shall be reported with the compressive strength test results.

END OF SECTION