

General Notes:

1. General:

- Workmanship and materials shall conform to the AASHTO LRFD Bridge Design Specification, 3rd Edition, and the Hawaii Standard Specifications for Bridge and Road Construction, as modified by the State of Hawaii Department of Transportation.
- The Contractor shall compare the Civil and Structural drawings with each other and report in writing to the Engineer, inconsistencies or omissions.
- All dimensions and elevations shown in details herein are taken from original contract design plans. The Contractor shall take field measurements and verify field conditions and shall compare such field measurements and conditions with the drawings before commencing the work. Report in writing to the Engineer all inconsistencies or omissions.
- The Contractor shall be responsible for methods of construction, workmanship and job safety. The Contractor shall provide temporary shoring and bracing as required for stability of culvert walls, wingwalls, structural members and systems.
- Details noted as typical on structural drawings shall apply in all conditions unless specifically shown or noted otherwise.
- The Contractor shall be responsible for coordinating the work of all trades.
- The Contractor shall be responsible for protection of the adjacent properties, structures, streets, and utilities during the construction period. Any damage or deteriorated property shall be restored to the same or better condition at no cost to the State.
- The Contractor shall perform a visual, hands-on inspection of all culverts prior to the start of work, in order to verify the spall and crack quantities. The inspection shall include sounding all concrete surfaces with a hammer to detect hollow, soft or otherwise deteriorated concrete. Report in writing to the Engineer all findings that do not agree with quantities listed in contract proposal.

2. Foundation:

- Foundation design is based upon geotechnical exploration report by Pacific Geotechnical Engineers, Inc., dated 3/29/04.
- Contractor shall provide for design and installation of all cribbing, sheeting, and shoring necessary for personnel safety and to preserve excavations and earth banks, and adjacent structures and property for damage.
- Footings shall bear on undisturbed in-situ firm soils. The soil beneath the footings shall be compacted to provide a relatively firm and smooth bearing surface prior to placement of reinforcing steel and concrete. If soft and/or loose materials are encountered at the bottom of footing excavation, they shall be over-excavated down to firm soil. The over-excavation shall be backfilled with select granular material up to the required bottom of footing elevation and compacted to a minimum of 95% relative compaction. The footing bottom may be extended down to the underlying competent material at no extra cost to the State.
- Excavation boundaries and grade elevations for footing shall be approved by the Engineer prior to placing the concrete and reinforcing.
- Structural fill and backfill shall consist of granular material conforming to the standard specifications with a CBR greater than 25.
- Structural fill and backfill shall be placed in uniform lifts of no more than 8 inches in loose thickness, moisture-conditioned to within 2 percent of the optimum moisture content, and uniformly compacted to at least 95 percent relative compaction except for retaining walls and wing walls which shall be compacted to at least 90% relative compaction.
- Relative compaction is defined as the dry density of the compacted material expressed as a percentage of the maximum dry density of the same material based on AASHTO T-180 test method.

3. Reinforcing Steel:

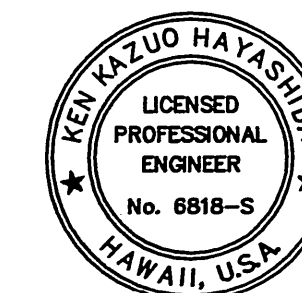
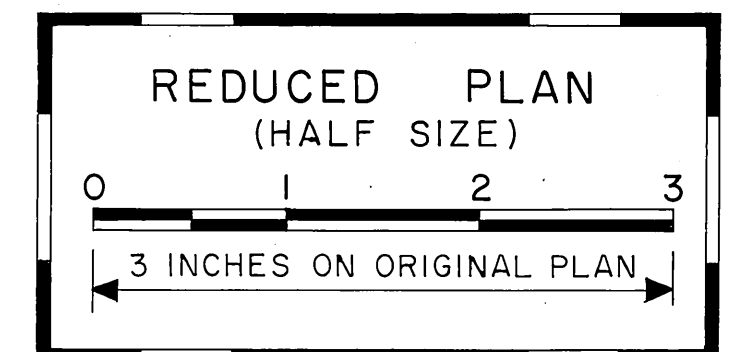
- Reinforcing steel shall be deformed bars conforming to ASTM A615, Grade 60. Any reinforcing steel to be welded shall be ASTM A706.
 - Clear concrete coverage for reinforcing bars shall be as follows, unless otherwise noted:
 - Footing, ETC.
Cast against earth _____ 3"
 - Footing, Grade Beams, ETC.
Formed and exposed to earth _____ 2"
 - Wall faces exposed to earth
or weather _____ 2"
 - Slab overlay (top clearance) _____ 3"
 - New concrete apron slab _____ 3"
 - Splices:
 - Reinforcing steel shall be detailed in accordance with the latest edition of the A.C.I. Detailing Manual unless otherwise noted. Lap splices not shown in the plans shall not be located in areas of high stress.
 - Mechanical splice connectors shall develop in tension 90 percent of the specified ultimate tensile strength of reinforcing bars.
 - Bar bends and hook shall be "standard hooks" in accordance with AASHTO LRFD Bridge Design Specifications, 3rd Edition.
- ### 4. Concrete:
- All concrete shall have a minimum 28-day compressive strength as noted below:
 - Retaining Walls _____ 4000 PSI
 - Slab Overlay _____ 4000 PSI
 - Apron and Cut-off Wall _____ 4000 PSI
 - Corrugated Metal Pipe Overlay _____ 4000 PSIAll structures not listed shall have a concrete compressive strength of 4,000 PSI at 28 days.
Concrete compressive cylinders are to be tested in accordance with ASTM C39.
 - Spall repair concrete shall be in accordance with Sht. S1.2.
 - Conduits, pipes, and sleeves passing through a culvert not conforming to typical details shall be located and submitted to the Engineer for approval.
 - Construction joints may be located by the Contractor and submitted to the Engineer for approval. Construction joints shall be made and located as not to impair the strength of the structure and to minimize shrinkage stresses. All construction joints shall be cleaned, laitance removed and wetted prior to placing new concrete.
 - All expansion joints shall be located as shown in plans. Expansion joints for overlay slab shall coincide with joints in existing slab.
 - Non-shrink grouts shall be premixed compound consisting of non-metallic aggregate and non-standing types, cement, water reducing and plasticizing agents capable of developing minimum compressive strength of 4,000 psi in 3 days and 7,000 psi in 28 days.
 - Concrete delivery tickets shall record all free water in the mix at batching by plant, for consistency by driver and any additional request by Contractor if permitted by the mix design.
 - Reinforcing bars, anchor bolts, inserts and other items to be cast in the concrete shall be secured in position prior to placement of concrete.
 - All drilled holes for dowels shall be brushed to remove loose material then cleaned with compressed air, prior to injecting the epoxy.
 - Epoxy shall conform to AASHTO M235, Type IV, Grade 3, Class C.

5. Structural Steel:

- Fabrication and erection of structural steel shall conform to the American Institute of Steel Construction Manual of Steel Construction, Ninth Edition.
 - Structural steel shall conform to ASTM A36 unless otherwise noted.
 - Steel wide flange sections shall conform to ASTM A992 Grade 50.
 - Steel tubes shall conform to ASTM A500, Grade B.
 - Bolts shall conform to ASTM A325, Type N. Use load indicator washers.
 - Welds and welding procedures shall conform to the Structural Welding Code AWS D1.1 of the American Welding Society.
 - Welding shall be performed by welders prequalified for welding procedures to be used.
 - Welding electrodes shall be E70XX.
 - Structural steel shall be hot-dip galvanized after fabrication according to ASTM A123.
 - All anchor bolts, plates, and other items to be cast in concrete shall be hot-dip galvanized according to ASTM A153 unless otherwise noted.
 - All damage to galvanized coating due to field drilling or shipping shall receive 2 coats of a cold applied galvanize metal coating. Cold galvanizing compound shall be by ZRC, Inc. or approved equal. Each coat shall be 1.5 mils, DFT.
- ### 6. Existing Concrete:
- Verify location of existing reinforcement with an electromagnetic rebar locator before drilling holes into existing concrete. Holes may need to be adjusted to avoid existing reinforcement.
 - Contractor shall not damage, cut or drill through existing reinforcing. If reinforcing is damaged, the Contractor shall inform the Engineer immediately and shall be responsible for repairing the damage at Contractor's sole expense and to the satisfaction of the Engineer.
 - All holes which need to be abandoned due to the presence of reinforcing, shall be filled with non-shrink grout.
 - The Contractor will not be paid for the holes which need to be filled and abandoned.
 - Relocated holes shall be located according to the following criteria:
 - Alternate hole shall be within 3" of the original hole.
 - The hole shall not occur within 3" of all edges.
 - Alternate hole shall be at least 1/2" clear distance from existing rebar.
 - Holes shall not be located within an existing crack in base concrete.

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| ORIGINAL PLAN | NOTE BOOK | No. | DATE | SURVEY PLOTTED BY | DRAWN BY | DESIGNED BY | CHECKED BY |
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| FED. ROAD DIST. NO. | STATE | PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
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| HAWAII | HAW. | 19FGH-01-07M | 2008 | 29 | 51 |



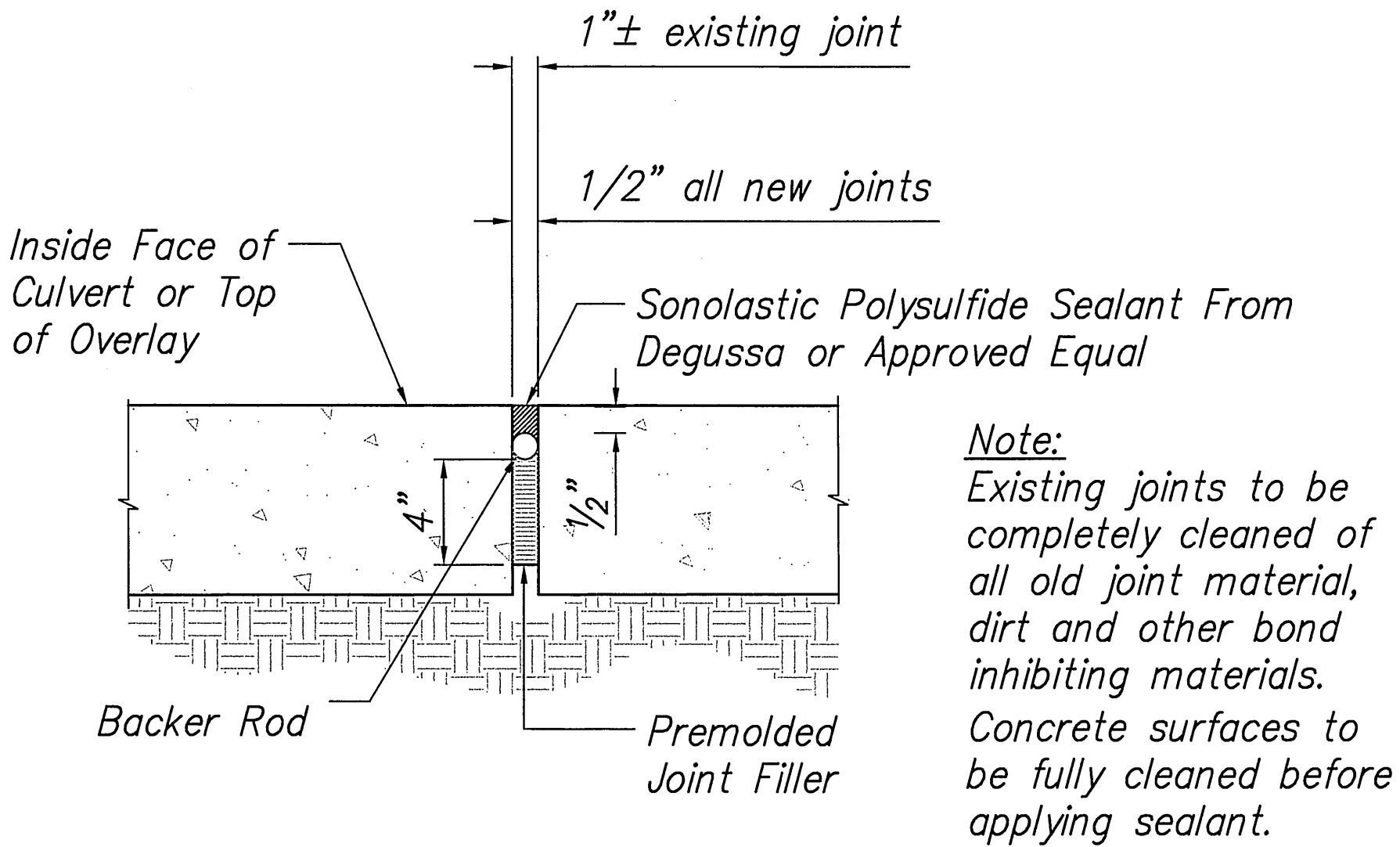
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|---|------------------|
| STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION | |
| STRUCTURAL NOTES | |
| HAWAII BELT ROAD DRAINAGE IMPROVEMENTS Project No. 19FGH-01-07M | |
| Scale: AS NOTED | Date: APRIL 2007 |
| SHEET No. S1.0 OF 51 SHEETS | |

| FED. ROAD DIST. NO. | STATE | PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
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| HAWAII | HAW. | 19FGH-01-07M | 2008 | 30 | 51 |

7. Demolition:
- A. During the demolition of the existing aprons, wing walls and applicable sections of culvert, no concrete, reinforcing steel or any other debris shall be allowed to fall into the streambed. Any debris that does inadvertently fall into the streambed shall be removed by the Contractor immediately, at his expense.
- B. When structures are to be modified and only portions of the existing structure are to be removed, these portions shall be removed in such a manner as to leave the remaining structure undamaged and in proper condition for the intended use. Any spalls, cracks or any other damage to the portions remaining in service shall be repaired by the Contractor at his expense. All spall repairs shall be according to the plans.
- C. Before beginning concrete removal operations involving the removal of a portion of a monolithic concrete element, a saw cut approximately 3/4" deep, without cutting existing rebars, shall be made to a true line along the limits of removal on all faces of the element which will be visible in the completed work. Old concrete shall be carefully removed to the lines designated by drilling, chipping or other methods approved by the Engineer. The surfaces presented as a result of this removal shall be reasonably true and even, with sharp, straight corners that will permit a neat and workmanlike joint with the new construction to be satisfactory for the purpose intended.
- D. Where existing reinforcing bars are to extend from the existing structure into new construction, the concrete shall be removed so as to leave the projecting bars clean, free of all concrete and undamaged. Where projecting bars are not to extend into the new construction, they shall be cut off flush with the surface of the old concrete.

8. Water Diversion, Dewatering:
- A. The contractor shall divert existing water flow through culverts to provide dry environment for concrete pour. All costs associated with diverting water flow shall be incidental to various contract items.
- B. Contractor shall provide for de-watering of excavation from either surface water, ground water or seepage. NPDES permit required for discharging into State waters.

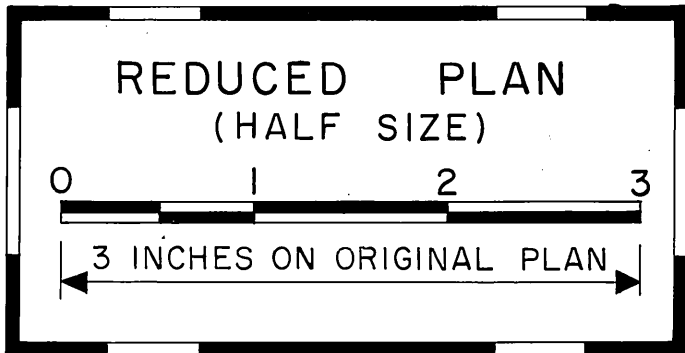


JOINT FILLER DETAIL

Not To Scale

1
S2.2, S1.1 | S1.1

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| ORIGINAL PLAN | SURVEY PLOTTED BY | DATE |
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| | CHECKED BY | |



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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

**STRUCTURAL NOTES AND
TYPICAL DETAILS**

HAWAII BELT ROAD DRAINAGE
IMPROVEMENTS
Project No. 19FGH-01-07M

Scale: AS NOTED Date: APRIL 2007

SHEET No. S1.1 OF 51 SHEETS

Surface Preparation Notes for Slab Overlay and Spall Repairs:

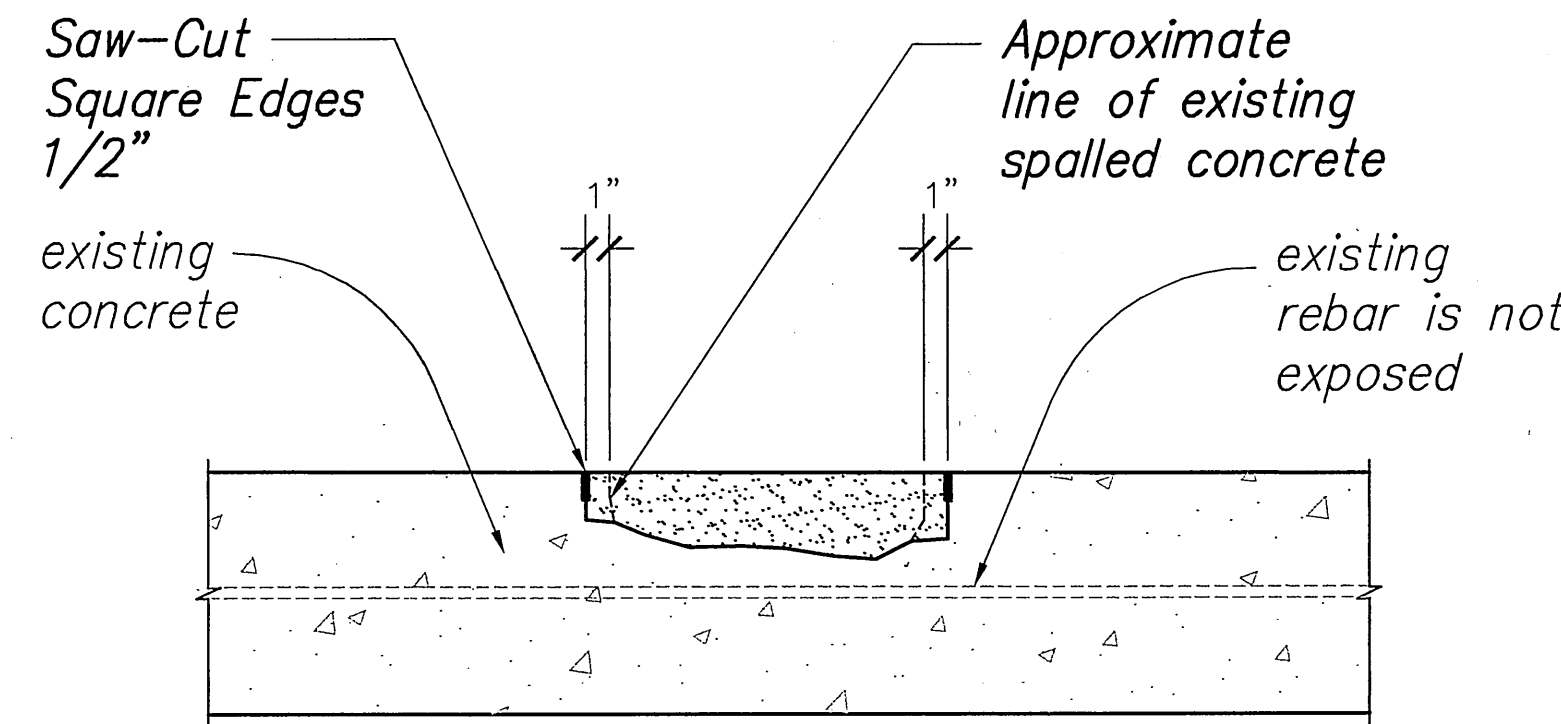
- A. Deteriorated concrete shall be removed down to sound substrate, or to the specified depth as noted in the spall repair details. Sawcut all edges $\frac{1}{2}$ ", no feathering of patching material is allowed. Avoid cutting any reinforcing steel when sawcutting. The exposed concrete shall be roughened to a $\frac{1}{8}$ " amplitude and shall be cleaned and free of laitance, dust, and other bond inhibiting materials.
- B. A means of collecting spoils from the chipping of concrete shall be instituted to avoid any debris or construction materials from falling into the stream. If the contractor elects to use hydro-scarification equipment, he/she shall be responsible for collecting and properly disposing of the runoff water generated. Runoff water will not be allowed to enter into the stream, or to constitute a hazard to adjacent drainage areas nor be allowed to erode existing slopes.
- C. All reinforcing steel damaged due to the contractor's operations shall be repaired by the contractor at his/her expense.
- D. Any exposed reinforcing steel, whether fully exposed or only partially exposed, shall be exposed all around, creating a minimum $\frac{3}{4}$ " annular space around rebar.

Bonding Agent :

- A. After the concrete surfaces have been prepared and cleaned, and immediately before placing the concrete patching or overlay, a thin coat of epoxy-modified bonding agent shall be applied. An appropriate percentage of the surface shall receive a thorough and even coating, and excess bonding agent shall not be permitted to collect in pockets. The rate of progress in applying the bonding agent shall be limited so that it does not become dry before it is covered with the concrete patching. During delays in the concrete patching operations, should the surface of the bonding agent become dry, the dried bonding agent shall be completely removed and fresh bonding agent applied. Removal shall be by sandblasting or by another procedure approved by the Engineer.
- B. All spall repairs shall have a coating of epoxy-modified bonding agent applied to prepared surface prior to adding patching mortar. Bonding agent shall be an epoxy-modified, cementitious material that can provide corrosion protection to the reinforcing steel and act as a bonding agent for the fresh patching mortar. The reinforcing steel shall receive two coats at 20 mils each, total of 40 mils. The concrete surface shall receive one coat at 20 mils. Follow manufacturer's specifications for recommended time between application of bonding agent and patching mortar. The minimum bond strength provided by the bonding agent shall be 2,400 PSI after 14 days (ASTM C-882). Bonding agent not required for slab overlays, except at locations noted on plans.

Polymer Modified Patching Mortar:

- A. Patching mortar shall be a polymer modified mortar, have high abrasion resistance and shall be suitable for horizontal and vertical surfaces. The minimum bond strength provided by the patching mortar shall be 2,200 PSI after 28 days (ASTM C-882). Refer to manufacturer's specifications for preparation and application guidance. Patching mortar and bonding agent/reinforcement protection shall be supplied by the same manufacturer and shall be fully compatible with each other.

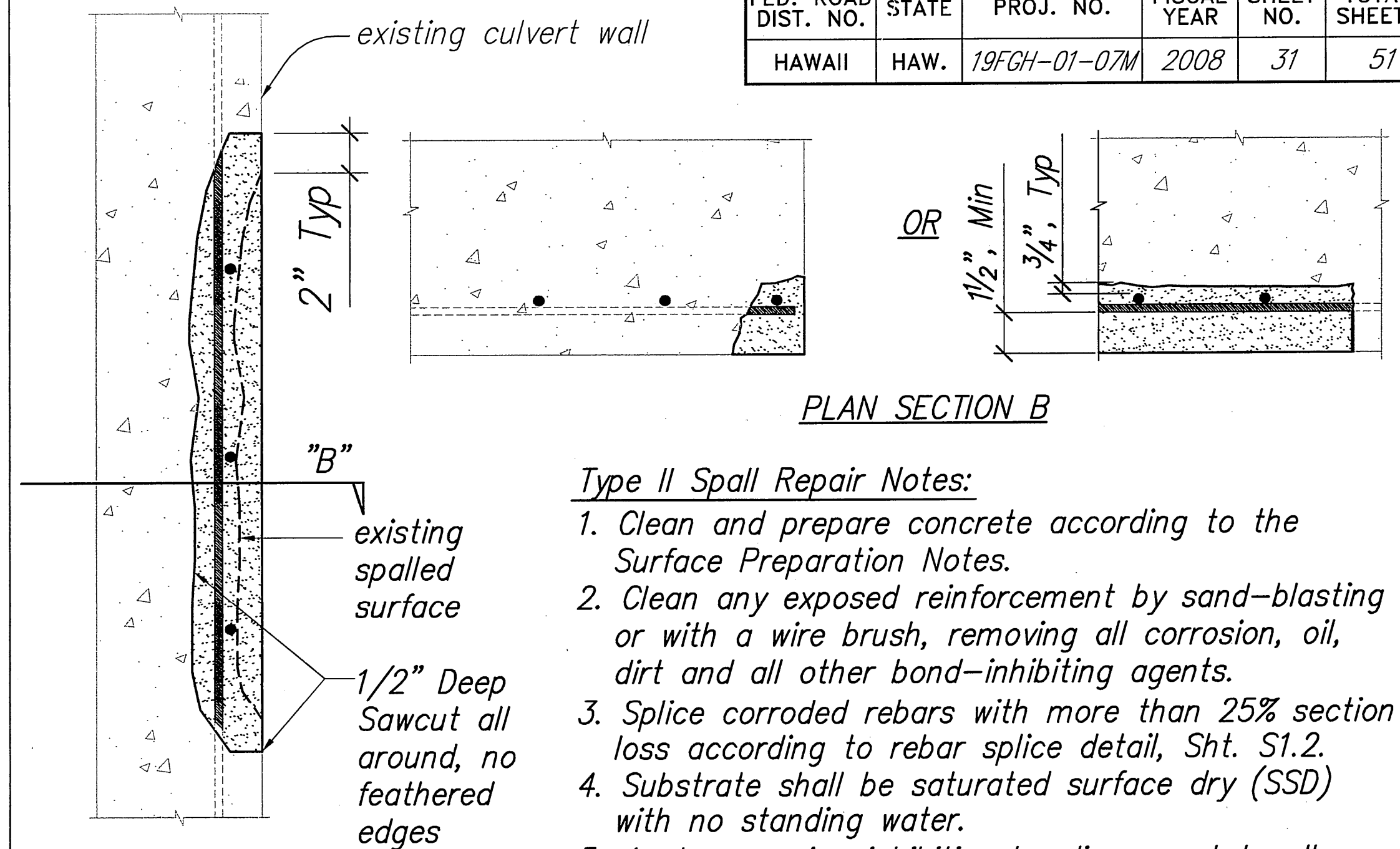


Type I Spall Repair Notes

1. Clean and prepare concrete according to the Surface Preparation Notes.
2. Substrate shall be saturated surface dry (SSD) with no standing water.
3. Apply corrosion inhibiting bonding agent to all surfaces to be patched.
4. Apply polymer modified patching mortar to repair areas to original finish lines, or until a minimum of $\frac{1}{2}$ " of cover over reinforcing steel is obtained.

SPALL DETAIL TYPE I

Not To Scale



Type II Spall Repair Notes:

1. Clean and prepare concrete according to the Surface Preparation Notes.
2. Clean any exposed reinforcement by sand-blasting or with a wire brush, removing all corrosion, oil, dirt and all other bond-inhibiting agents.
3. Splice corroded rebars with more than 25% section loss according to rebar splice detail, Sht. S1.2.
4. Substrate shall be saturated surface dry (SSD) with no standing water.
5. Apply corrosion inhibiting bonding agent to all surfaces to be patched, including reinforcing steel.
6. Apply polymer modified patching mortar to repair areas to original finish lines, or until a minimum of $\frac{1}{2}$ " of cover over reinforcing steel is obtained.

SPALL DETAIL TYPE II

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Note:

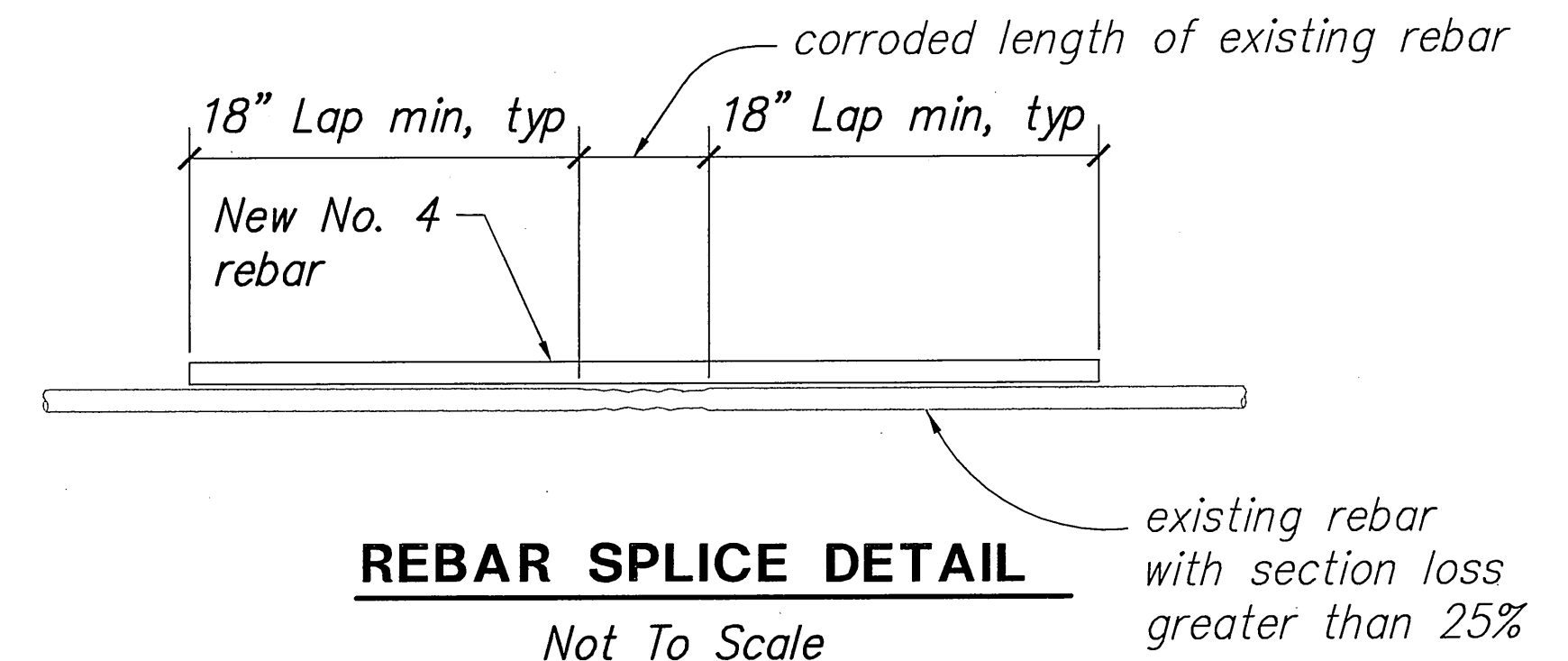
The concrete along the cracks to be repaired shall be cleaned by sand blasting or water blasting down to clean, sound concrete. All dirt, algae, oil and any other material, other than firm, sound concrete, shall be removed. All concrete dust shall be removed prior to applying the sealer coat.

Apply seal coat of epoxy over crack. Install injects ports. Pressure inject crack with a low viscosity, moisture-tolerant, high strength epoxy adhesive in accordance with Manufacturer's Specifications. The adhesive shall conform to ASTM C-881 and AASHTO M-235 Specifications.

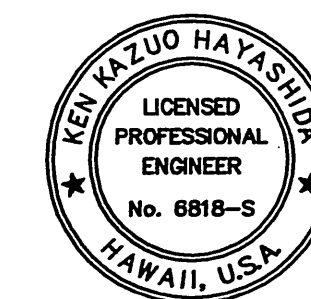
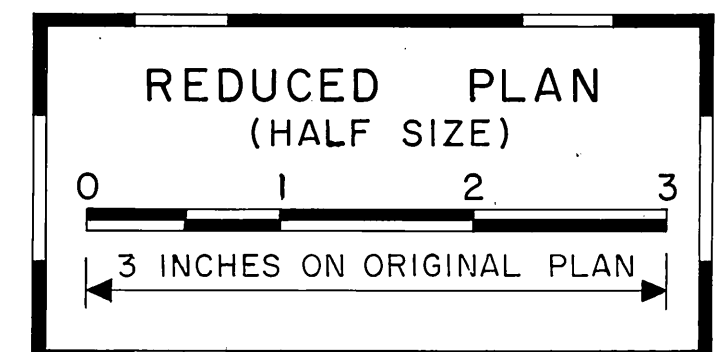
CRACK REPAIR

Not To Scale

PLAN VIEW



| REPAIR QUANTITIES | | | |
|-------------------|-------------|--------------|-----------------------|
| Mile Post | Type I (SF) | Type II (SF) | Stone Repointing (LF) |
| 19.55 | 25 | 18 | 0 |
| 21.92 | 1 | 0 | 0 |
| 27.10 | 0 | 0 | 105 |
| 31.45 | 23 | 3 | 0 |



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STATE OF HAWAII
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HIGHWAYS DIVISION
**SPALL REPAIR
NOTES AND DETAILS**

HAWAII BELT ROAD DRAINAGE
IMPROVEMENTS
Project No. 19FGH-01-07M

Scale: AS NOTED Date: APRIL 2007

SHEET No. S1.2 OF 51 SHEETS