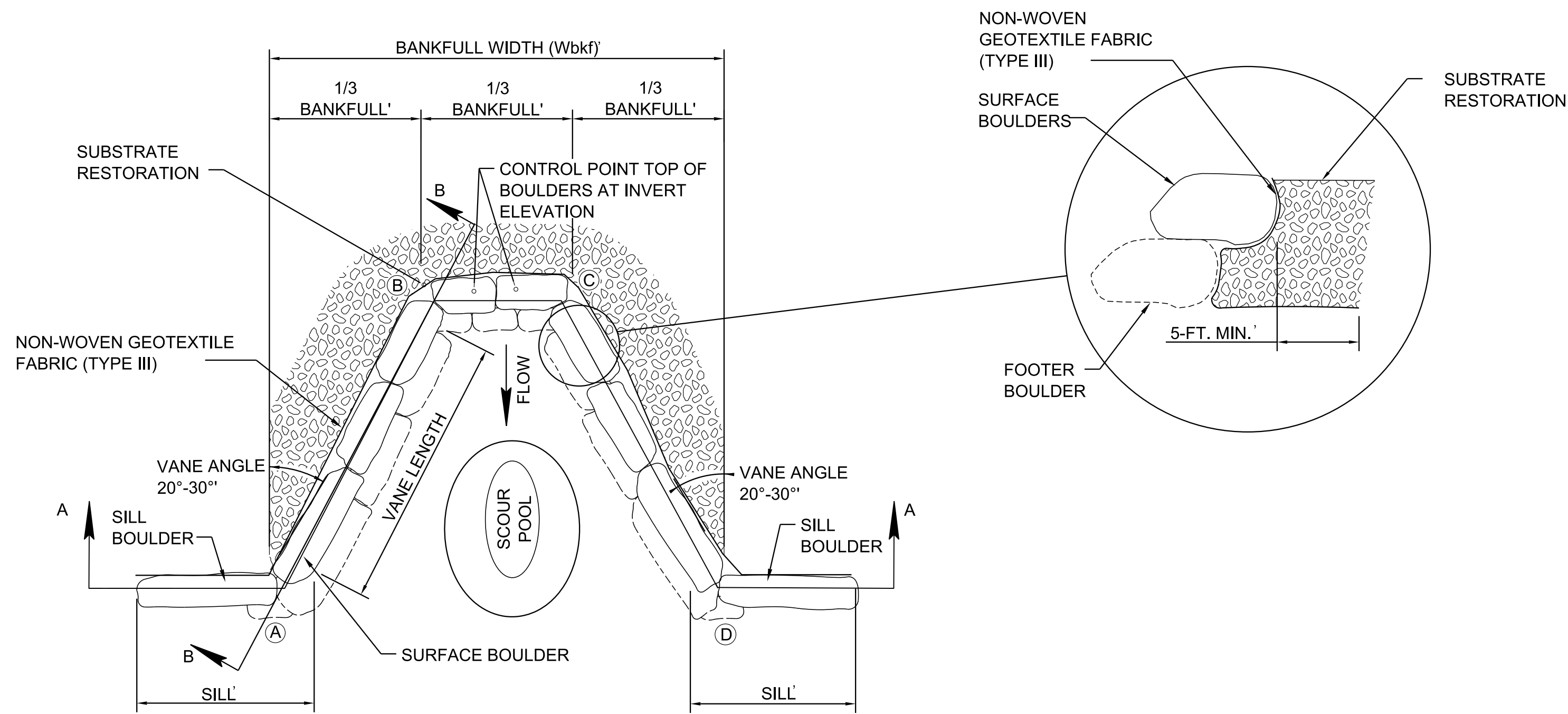
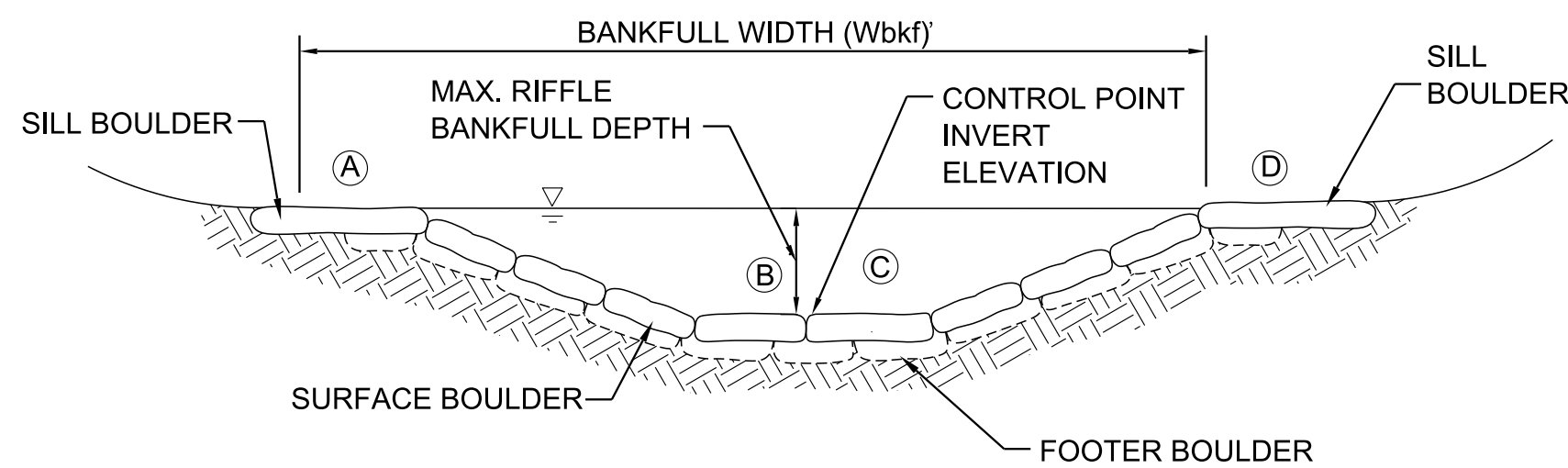


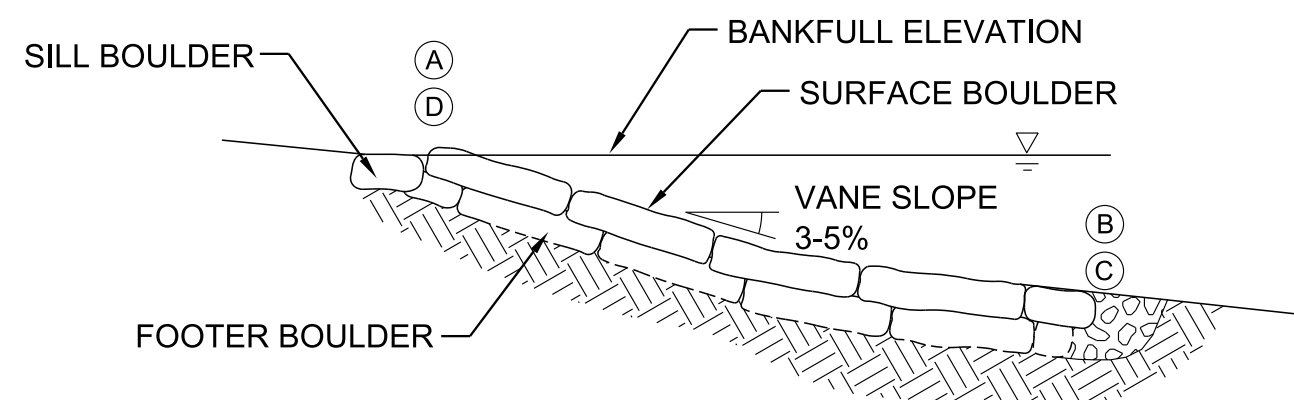
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PLAN VIEW

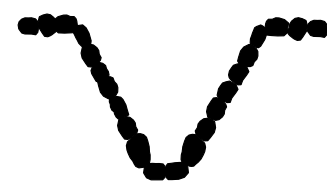


SECTION A-A



SECTION B-B

STREAM MITIGATION PLAN LEGEND:



BOULDER CROSS VANE

BOULDER CROSS VANE NOTES

- (A) BOULDER CROSS VANES ARE HYDRAULIC AND GRADE CONTROL MEASURES THAT ARE USED TO DIRECT FLOW AWAY FROM THE CHANNEL BANK, CONCENTRATE FLOWS INTO THE CENTER OF THE CHANNEL, AND ENHANCE HABITAT. THEY ARE COMMONLY USED FOR GRADE CONTROL AT THE UPSTREAM AND DOWNSTREAM EXTENT OF STREAM RESTORATION REACHES AND UPSTREAM OF PLANNED RIFFLES TO AID IN RIFFLE DEVELOPMENT AND MAINTENANCE.
- (B) BOULDER CROSS VANES SHOULD BE PLACED AT THE STATIONS, OFFSETS, ELEVATIONS, AND CONFIGURATION INDICATED ON THE STREAM MITIGATION DATA TABLE IN THE PROJECT PLANS, STREAM MITIGATION PLAN, OR AS DIRECTED BY THE ENGINEER. AT A MINIMUM, THE BANKFULL WIDTH, MEDIAN BOULDER SIZE, VANE AND SILL LENGTHS, AND INVERT ELEVATION, SHOULD BE SPECIFIED IN THE STREAM MITIGATION DATA TABLE.
- (C) REFER TO D-NSD-37 "SPECIAL NOTES FOR NATURAL STREAM DESIGN".
- (D) BOULDERS PRESENT IN THE EXISTING STREAM MEETING THE SPECIFIED TYPE AND SIZE SHOULD BE USED IN THE RESTORED CHANNEL SEGMENT.
- (E) THE WEIR OF THE BOULDER CROSS VANE IS TYPICALLY LOCATED IN THE CENTER THIRD OF THE STREAM CHANNEL, UNLESS THE STRUCTURE IS DESIGNED WITH OFF-SET VANES TO CONFORM TO BENDS IN THE CHANNEL. THE SURFACE BOULDERS COMPRISING THE WIER ARE SET AT THE INVERT ELEVATION OF THE STRUCTURE.
- (F) A MIXTURE OF SELECT MATERIALS, AS SPECIFIED ON THE STREAM MITIGATION PLAN SHEETS, SHOULD BE USED FOR SUBSTRATE RESTORATION IN RIFFLE AND RUN HABITATS AND TO FILL GAPS IN THE VANE BOULDERS. COARSE ALLUVIUM EXCAVATED FROM THE EXISTING STREAM BED, WHICH MEETS THE SPECIFIED SIZE CLASSIFICATION, IS THE PREFERRED MATERIAL TO USE FOR SUBSTRATE RESTORATION. REFER TO D-NSD-30 AND D-NSD-37 FOR ADDITIONAL SUBSTRATE RESTORATION INFORMATION.
- (G) CONSTRUCT BOULDER CROSS VANE STRUCTURES BY:
- (1) FIRST SHAPE CHANNEL AND FLOODPLAIN TO THE SPECIFIED GRADE AND DIMENSIONS.
 - (2) NEXT, EXCAVATE ENOUGH BED MATERIAL TO PLACE THE BOULDERS, NON-WOVEN GEOTEXTILE FABRIC (TYPE III) AND SELECT MATERIAL FOR BACKFILL AND SUBSTRATE REPLACEMENT.
 - (3) PLACE FOOTER BOULDERS AND SURFACE BOULDERS AT THE CHANNEL INVERT AND THEN USE SURVEY EQUIPMENT TO CHECK THE ELEVATIONS OF THE INVERTS IN ACCORDANCE WITH THE STREAM MITIGATION PLANS.
 - (4) ONCE THE INVERTS HAVE BEEN ESTABLISHED, THE REMAINDER OF THE FOOTER AND SURFACE BOULDERS SHALL BE PLACED, MINIMIZING VOIDS.
 - (5) FILL THE VOIDS BETWEEN BOULDERS ON THE UPSTREAM SIDE OF THE STRUCTURE.
 - (6) PLACE NON-WOVEN GEOTEXTILE FABRIC (TYPE III) ALONG THE ENTIRE UPSTREAM FACE OF THE STRUCTURE, EXTENDING FROM THE BOTTOM OF THE FOOTER TO THE FINISHED GRADE ELEVATION. ONLY GEOTEXTILE FABRIC (TYPE III) LISTED ON THE QUALIFIED PRODUCTS LIST SHALL BE USED.
 - (7) BACKFILL STRUCTURE AND NON-WOVEN GEOTEXTILE FABRIC (TYPE III) WITH EXCAVATED ON-SITE STREAM ALLUVIUM (IF AVAILABLE). OTHERWISE USE THE SPECIFIED SELECT MATERIAL. SOIL SHALL BE COMPACTED WELL AROUND BURIED PORTIONS OF THE STRUCTURE. TRIM ANY EXPOSED NON-WOVEN GEOTEXTILE FABRIC (TYPE III).
 - (8) ONCE THE STRUCTURE IS INSTALLED, EXCAVATE SCOUR POOL AND PLACE SELECT MATERIAL AS REQUIRED.
 - (9) RE-DRESSING OF CHANNEL AND BANKFULL BENCH/FLOODPLAIN WILL LIKELY BE REQUIRED FOLLOWING INSTALLATION OF IN-STREAM STRUCTURES AND SHALL BE CONSIDERED INCIDENTAL TO CONSTRUCTION.
- (H) THE SURFACE OF CROSS VANES SHALL BE FINISHED TO A SMOOTH AND COMPACT SURFACE IN ACCORDANCE WITH THE LINES, GRADES AND CROSS SECTIONS OR ELEVATIONS SHOWN ON THE PLANS. THE DEGREE OF FINISH FOR INVERT ELEVATIONS SHALL BE WITHIN 0.10 FOOT OF THE GRADES AND ELEVATIONS INDICATED, OR AS DIRECTED BY THE ENGINEER. ALL GAPS OR VOIDS SHALL BE PLUGGED WITH SELECT MATERIAL TO FORM A TIGHT-FITTING SEAL.
- (I) ALL MATERIALS ARE TO BE APPROVED BY ENGINEER OR ENGINEER'S ON-SITE CONSTRUCTION OBSERVER.
- (J) BOULDER CROSS VANES SHALL BE PAID FOR UNDER THE FOLLOWING ITEM NUMBER:

209-03.37 STREAM MITIGATION - CROSS VANE STRUCTURE PER EACH

PAYMENT SHALL INCLUDE ALL MATERIALS, EQUIPMENT, AND LABOR NECESSARY FOR THE CONSTRUCTION OF THE BOULDER CROSS VANE.

MATERIAL SHOWN ARE ONLY A GRAPHICAL REPRESENTATION AND DO NOT DEPICT THE ACTUAL DEPTH OR QUANTITY OF MATERIALS TO APPROPRIATELY CONSTRUCT OR STABILIZE THE CHANNEL.

NOT TO SCALE

STATE OF TENNESSEE
DEPARTMENT OF
TRANSPORTATION

BOULDER
CROSS VANE

11-01-16

D-NSD-22