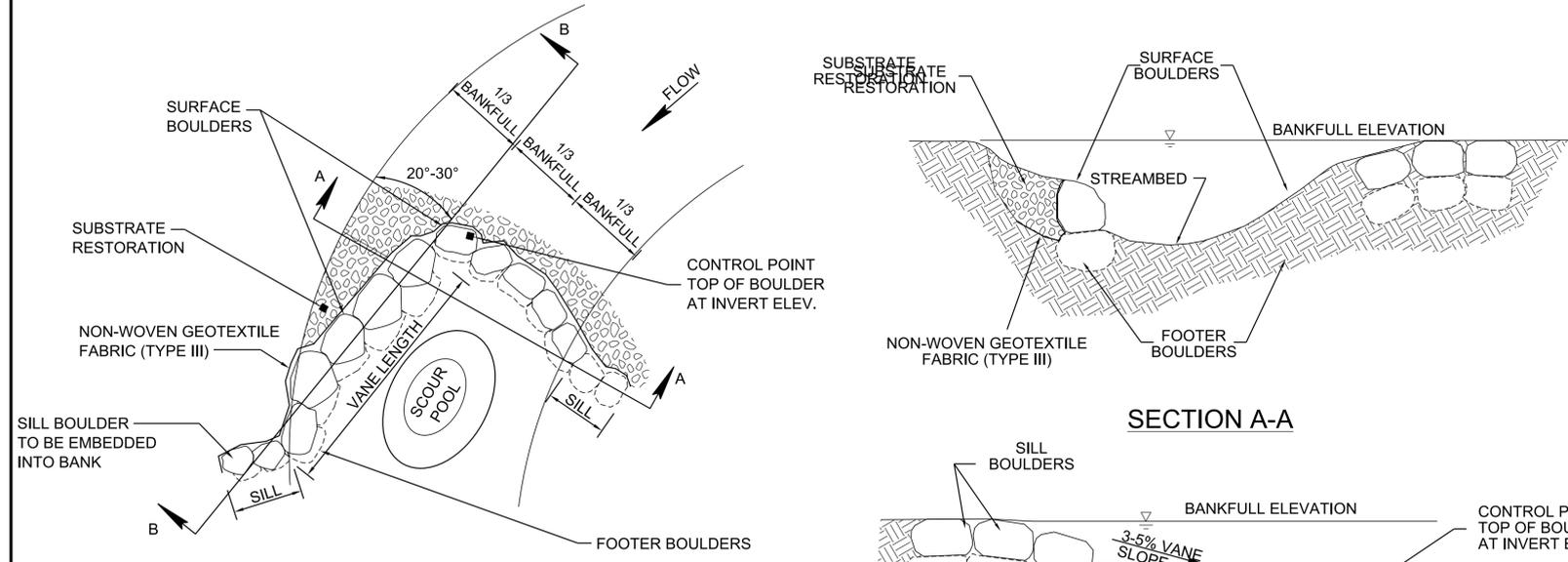
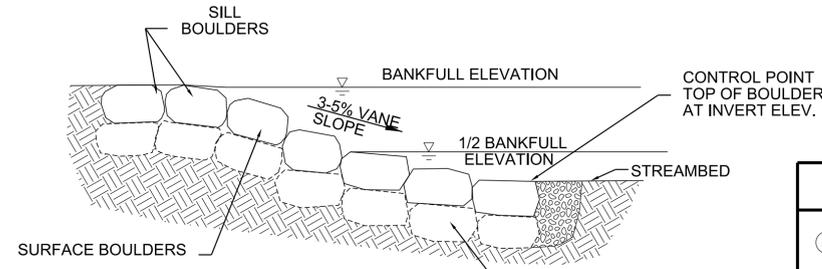


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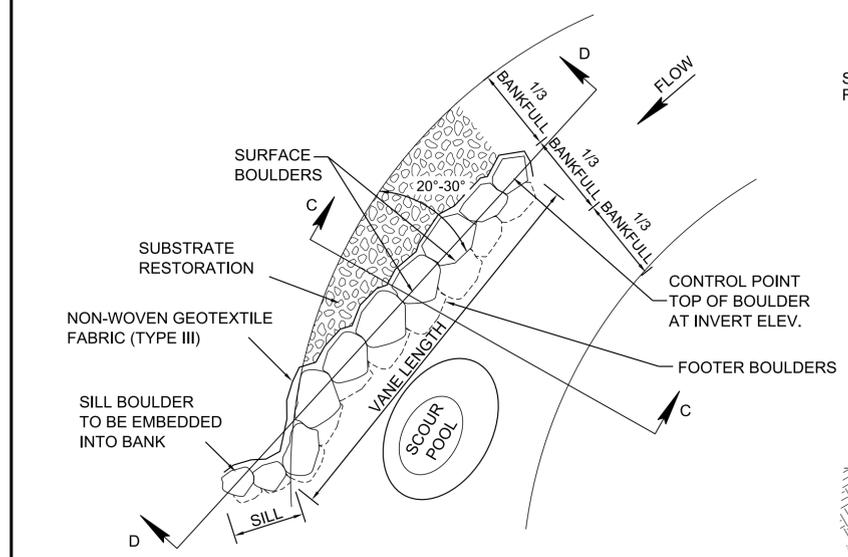


**BOULDER VANE AND J-HOOK
PLAN VIEW**

SECTION A-A

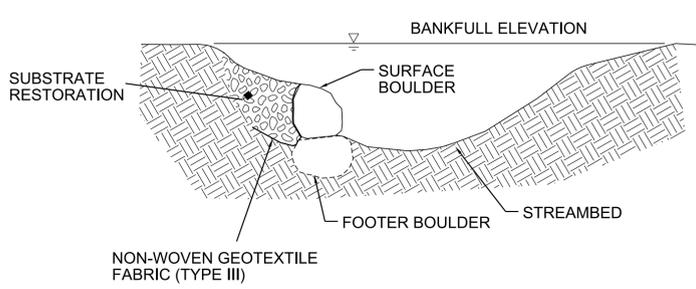


SECTION B-B



**BOULDER VANE
PLAN VIEW**

SECTION C-C



SECTION D-D

BOULDER VANES AND J-HOOK NOTES

- (A) BOULDER VANES AND BOULDER VANES WITH J-HOOKS ARE HYDRAULIC MEASURES THAT ARE USED ALONG THE OUTSIDE BANKS OF MEANDER BENDS TO DIRECT FLOW AWAY FROM THE STREAM BANK, CONCENTRATE FLOWS INTO THE CENTER OF THE CHANNEL, AND ENHANCE HABITAT. WHEN BOULDER J-HOOKS ARE USED IN COMBINATION WITH BOULDER VANES, THEY ALSO PROVIDE GRADE CONTROL.
- (B) BOULDER VANES AND J-HOOKS 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, J-HOOK, AND SILL LENGTHS AND INVERT ELEVATIONS; 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 BOULDER J-HOOK SHOULD BE CONSTRUCTED FROM THE END OF THE BOULDER VANE, ACROSS THE REMAINING TWO-THIRDS OF THE BANKFULL CHANNEL, TERMINATING WITH A BOULDER SILL. THE SURFACE BOULDERS IN THE CENTER OF THE J-HOOK 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 VANES AND BOULDER VANES WITH J-HOOKS BY:
 - (1) FIRST SHAPE CHANNEL AND FLOODPLAIN TO THE SPECIFIED GRADES 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 BOULDER VANES AND J-HOOKS 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 VANES AND J-HOOKS SHALL BE PAID FOR UNDER THE FOLLOWING ITEM NUMBER:
 - 209-03.60 STREAM MITIGATION - ROCK VANE PER EACH
 - 209-03.38 STREAM MITIGATION - J-HOOK PER EACH

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

STREAM MITIGATION PLAN LEGEND:



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 VANES
AND J-HOOK**