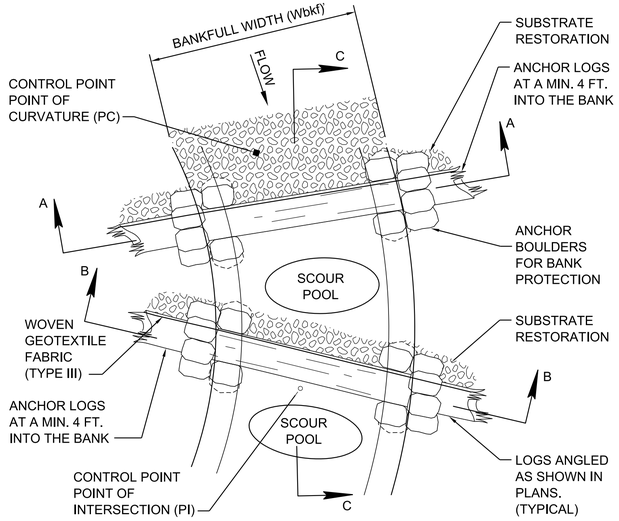
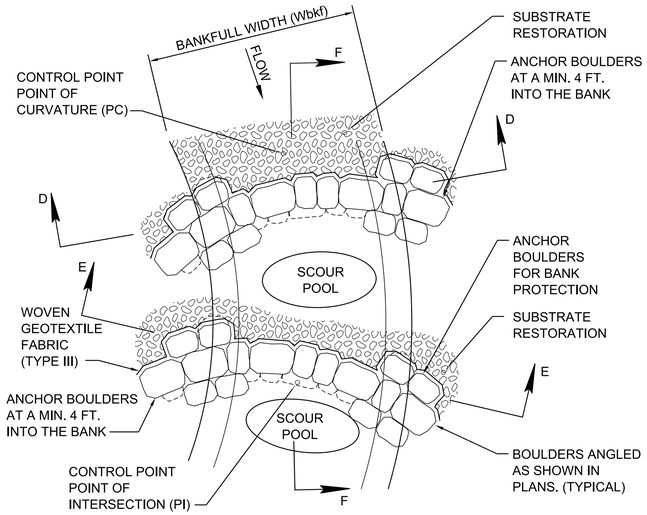
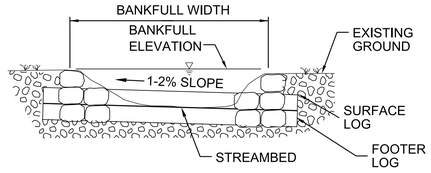


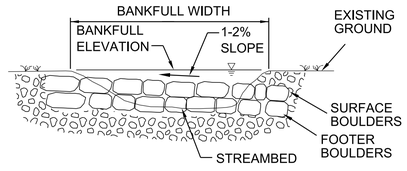
LOG STEP POOL
PLAN VIEW



BOULDER STEP POOL
PLAN VIEW



SECTION A-A



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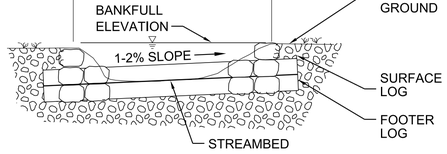

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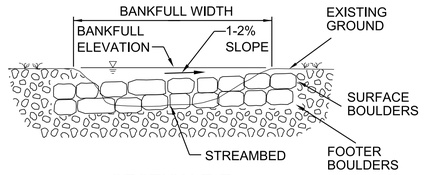

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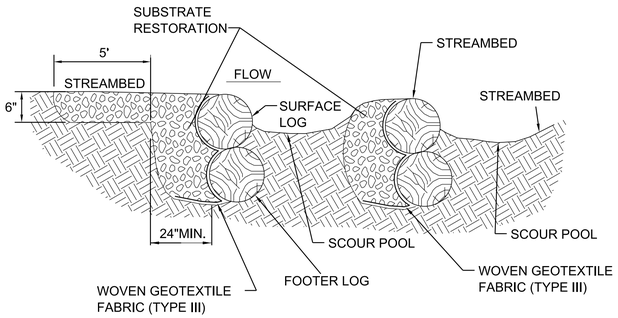
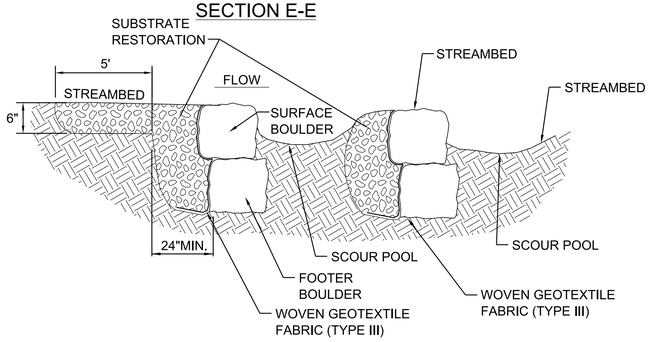


SECTION C-C



SECTION F-F

STREAM MITIGATION PLAN LEGEND: LOG STEP POOLS BOULDER STEP POOLS

*BOULDER SHOWN ARE A GRAPHICAL REPRESENTATION AND DOES NOT REPRESENT ACTUAL # OF BOULDERS TO BE USED.

LOG AND BOULDER STEP POOLS NOTES

(A) LOG AND BOULDER STEP POOLS ARE HYDRAULIC AND GRADE CONTROL MEASURES THAT ARE USED TO MAINTAIN GRADE, CONTROL FLOW VELOCITY, DISSIPATE ENERGY, AND DEVELOP RIFFLE-RUN-STEP POOL HABITAT IN STREAMS WITH SLOPES GREATER THAN 2%. THIS DETAIL CAN BE USED FOR CONSTRUCTING A SINGLE LOG OR BOULDER STEP POOL OR A SERIES OF MULTIPLE STEP POOLS.

(B) LOG AND BOULDER STEP POOL STRUCTURES AND ASSOCIATED POOL HABITAT ENHANCEMENTS AND BANK STABILIZATION MEASURES (ROOT WADS, BRUSH LAYERING, LIVE STAKING, ETC.) SHOULD BE PLACED AT THE STATIONS, OFFSETS, ELEVATIONS, AND GEOMORPHIC POSITIONS 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, MINIMUM LOG AND BOULDER DIMENSIONS, INVERT ELEVATIONS, ESTIMATED SCOUR DEPTH AND SELECT MATERIAL CLASSIFICATION SHOULD BE SPECIFIED IN THE STREAM MITIGATION DATA TABLE.

(C) REFER TO D-NSD-37 "SPECIAL NOTES FOR NATURAL STREAM DESIGN".

(D) LOGS SHALL BE RELATIVELY STRAIGHT, RECENTLY HARVESTED AND DECAY RESISTANT SPECIES SUCH AS CEDAR, WHITE OAK, ETC.

(E) BOULDERS PRESENT IN THE EXISTING STREAM MEETING THE SPECIFIED TYPE AND SIZE SHOULD BE USED IN THE RESTORED CHANNEL SEGMENT.

(F) LOCATE LOG OR BOULDER STEP STRUCTURES IN THE CHANNEL AT THE POINTS OF CURVATURE AND TANGENCY IN MEANDER BENDS, AND ALIGN THE STRUCTURE ALONG THE AXIS OF THE RADIUS.

(G) CONSTRUCT STEP STRUCTURES WITH A MAXIMUM DROP OF A HALF FOOT (SIX INCHES) AND A SLOPE BETWEEN ONE PERCENT (1%) AND FOUR PERCENT (4%).

(H) CONSTRUCT LOG OR BOULDER STEPS STRUCTURES BY:

(1) FIRST SHAPE THE CHANNEL AND FLOODPLAIN TO THE SPECIFIED GRADES AND DIMENSIONS.
(2) NEXT, EXCAVATE ENOUGH BED MATERIAL TO PLACE THE LOGS AND/OR BOULDERS, NON-WOVEN GEOTEXTILE FABRIC (TYPE III) AND ALLUVIUM OR SELECT MATERIAL BACKFILL.
(3) PLACE FOOTER LOG OR BOULDERS AND SURFACE BOULDERS AT THE CHANNEL INVERT, WITH THE SURFACE LOG OR BOULDERS SLIGHTLY UPSTREAM OF THE FOOTER LOG OR BOULDERS. SURFACE AND FOOTER LOGS SHOULD EXTEND A MINIMUM OF FOUR FEET INTO EACH BANK AND LOG STEPS SHOULD BE PINCHED OR ANCHORED INTO THE BANKS WITH BOULDERS.
(4) THE FOLLOWING GUIDELINES APPLY WHEN INSTALLING MULTIPLE STEP POOL STRUCTURES IN SEQUENCE:
  (a) THE INVERT ELEVATION OF THE DOWNSTREAM STEP SHALL BE AT OR ABOVE THE TOP OF THE FOOTER FOR THE UPSTREAM STRUCTURE.
  (b) ALTERNATE INVERTS OF THE STRUCTURES FROM SIDE TO SIDE IN THE CHANNEL TO CREATE A MEANDERING FLOW PATH ACROSS THE STRUCTURES.
(5) USE SURVEY EQUIPMENT TO CHECK THE ELEVATIONS OF THE INVERTS IN ACCORDANCE WITH THE STREAM MITIGATION PLANS.
(6) ONCE THE INVERTS HAVE BEEN ESTABLISHED, FILL THE VOIDS BETWEEN LOGS OR BOULDERS ON THE UPSTREAM SIDE OF THE STRUCTURE.
(7) 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. FOR LOGS, NAIL GEOTEXTILE FABRIC (TYPE III) TO THE SURFACE LOG APPROXIMATELY ONE QUARTER OF THE CIRCUMFERENCE DOWN FROM THE TOP OF THE SURFACE LOG USING TWO-INCH GALVANIZED ROOFING NAILS ON ONE-FOOT SPACING ALONG THE ENTIRE LENGTH OF THE LOG.
(8) 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).
(9) ONCE THE STRUCTURE IS INSTALLED, EXCAVATE THE DOWNSTREAM SCOUR POOL AND PLACE SELECT MATERIAL AS REQUIRED.
(10) 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.

(I) 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.

(J) THE SURFACE OF LOG AND BOULDER STEP POOL SHALL BE FINISHED TO A NEAT 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.

(K) ALL MATERIALS ARE TO BE APPROVED BY ENGINEER OR ENGINEER'S ON-SITE CONSTRUCTION OBSERVER.

(L) LOG AND BOULDER STEP POOLS SHALL BE PAID FOR UNDER THE FOLLOWING ITEM NUMBER:

209-03.36 STREAM MITIGATION - STEP POOL PER EACH

PAYMENT SHALL INCLUDE ALL MATERIALS, EQUIPMENT, AND LABOR TO CONSTRUCT LOG AND BOULDER STEP POOLS.

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

LOG AND BOULDER STEP POOLS

11-01-16 D-NSD-27