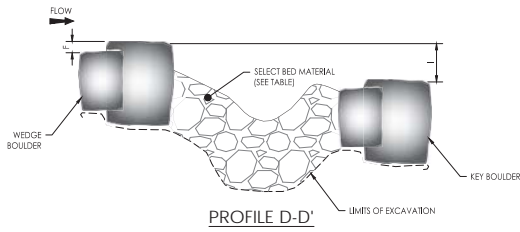
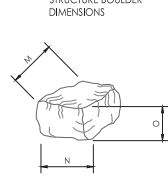


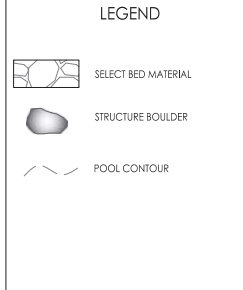
PLAN - SYMBOL



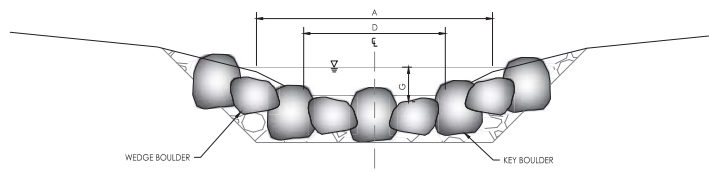
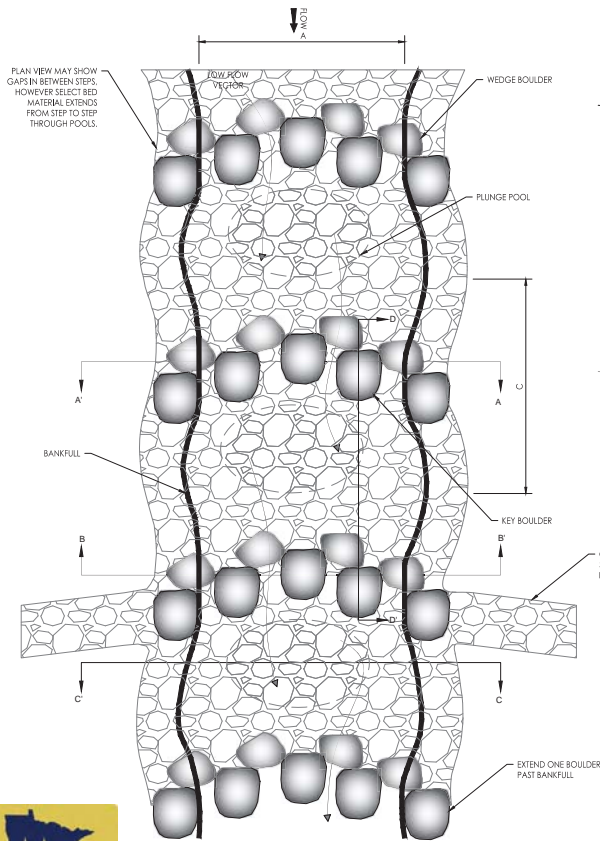
PROFILE D-D'



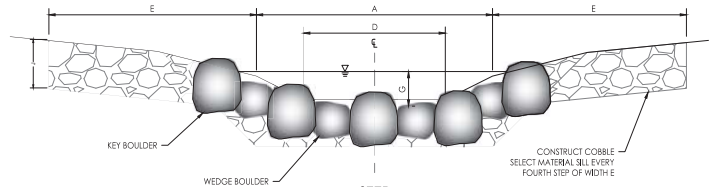
STRUCTURE BOULDER DIMENSIONS



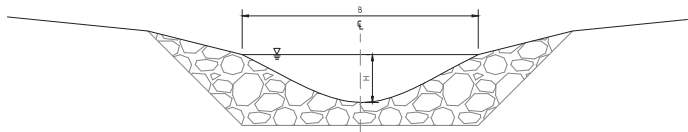
LEGEND



STEP SECTION A-A' (LOOKING DOWNSTREAM)



STEP SECTION B-B' (LOOKING UPSTREAM)



POOL SECTION C-C'

NOTES:

- REFER TO STRUCTURE TABLE FOR DIMENSIONS.
- BOULDER JAM STEP IS CONSTRUCTED BY FIRST PLACING KEY BOULDERS SUCH THAT THEY SPAN THE CHANNEL AS INDICATED IN THE DETAIL. WEDGE BOULDERS ARE PLACED IMMEDIATELY UPSTREAM OF THE KEY BOULDERS TO FILL GAPS BETWEEN KEY BOULDERS AND TO PROVIDE THE LOW-FLOW DROP. SELECT BED MATERIAL IS THEN PLACED TO CHINK THE GAPS BETWEEN ALL BOULDERS.
- WEDGE BOULDERS SHALL FIT TIGHTLY BETWEEN KEY BOULDERS SUCH THAT THEY CANNOT BE PUSHED THROUGH THE GAP BETWEEN THE KEY BOULDERS.
- ONLY TOP PORTION OF KEY BOULDER IS VISIBLE.
- KEY BOULDERS ARE PLACED IN A SLIGHT ARCH ACROSS THE CHANNEL SUCH THAT THE APEX OF THE ARCH IS ORIENTED FACING UPSTREAM.
- EXCAVATION WILL LIKELY BE REQUIRED TO GET KEY BOULDERS SET AT THE PROPER ELEVATIONS. THIS IS CONSIDERED INCIDENTAL TO CONSTRUCTION.
- BOULDERS SHALL BE PLACED AS SHOWN IN THE DETAIL.
- THE STEP UNIT IS THE LENGTH BETWEEN THE CREST OF A DROP AND THE CREST OF THE NEXT DROP. THE CREST DOES NOT NECESSARILY COINCIDE WITH THE KEY BOULDER.
- PLACEMENT OF FABRIC AND CHINKING THE GAPS BETWEEN THE BOULDERS WITH THE SELECT BED MATERIAL IS INCIDENTAL TO CONSTRUCTION AND SHALL BE ACCOUNTED FOR IN THE BID PRICE FOR THIS ITEM.
- THE QUANTITY OF BOULDERS ILLUSTRATED IN THE DETAIL DOES NOT NECESSARILY EQUAL THE QUANTITY REQUIRED FOR THE STRUCTURE. SMALLER BOULDER JAM STEP SYSTEMS WILL HAVE FEWER BOULDERS AND LARGER SYSTEMS WILL HAVE MORE.
- WEDGE BOULDER ELEVATIONS SHALL VARY VERTICALLY A SLIGHT AMOUNT IN CROSS SECTION TO PROMOTE A LOW FLOW PATH THAT ALTERNATES ACROSS THE CHANNEL.
- THE SELECT BED MATERIAL SHOWN ON THIS DETAIL IS APPLICABLE ONLY TO THIS STRUCTURE.
- SELECT BED MATERIAL IS PLACED ALONG ENTIRE PROFILE.
- STEP HEIGHT REFERS TO DROP FROM STEP TO WATER SURFACE BELOW, WHICH IS SET BY THE NEXT "RIFLE" ELEVATION, AS SHOWN ON PROFILE.
- CONTRACTOR IS RESPONSIBLE FOR ACQUIRING SELECT BED MATERIAL THAT SATISFIES D₅₀, D₁₀, AND D₁₅₀ REQUIREMENTS.
- WEDGE BOULDER DIMENSIONS ARE EQUAL TO THE D100 OF THE SELECT BED MATERIAL AS APPROPRIATE.
- QUANTITIES SHOWN ARE ESTIMATES. CONTRACTOR SHALL VERIFY ALL QUANTITIES.
- ON-SITE GRAVEL/COBBLE IS AN ESTIMATED QUANTITY FOR THE STRUCTURE THAT WILL NOT NEED TO BE BROUGHT IN FROM OFF-SITE.
- REFER TO PROFILE FOR STEP ELEVATIONS.
- BOULDER LENGTH MAY EXCEED MINIMUM SHOWN.
- WHERE AVAILABLE, WOOD SHALL BE PLUMED INTO POOLS SUCH THAT IT WILL NOT MOVE UNDER HIGH FLOWS. THE WOOD IS INSTALLED STRICTLY FOR HABITAT AND AS A CARBON SOURCE AND SHOULD NOT BE STRUCTURAL IN NATURE.

SPECIAL CONSTRUCTION NOTE:

FOR UNNAMED TRIBUTARY REACH 9, EVERY THIRD STEP SHALL INCORPORATE STRUCTURAL WOOD INTO THE STEP ITSELF. THE WOOD, IF 18" IN DIAMETER, CAN BE USED AS THE GRADE CONTROL FOR THAT DROP, AND SHALL BE INSTALLED WITH A FOOTING LOG OF MINIMUM DIAMETER OF 18" AS WELL.

Revision	By	App'd	Y/M/D



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TS	MFA	MAS	10/25/21
Des	Chd	Dgn	YY/M/DO

Drawing No. DETAILS-1
 Revision Sheet



1/38 DETAIL - BOULDER JAM STEP
 NOT TO SCALE

Figure 6. The Boulder Jam Stem is a structure that contains a cross-vane.

REF: USACE EM 1110-2-1601 JUNE 1994