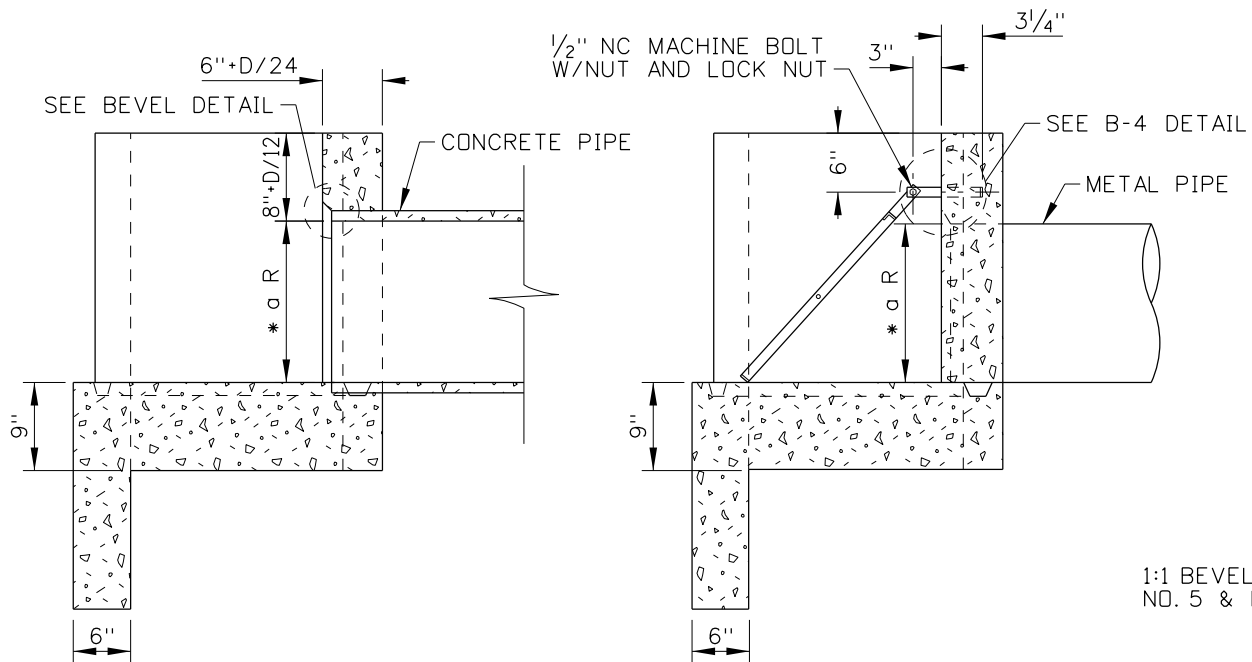


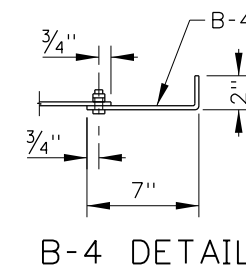
ELEVATION

* a S=SPAN & R=RISE:
 "D/24" VALUE=((S+R)/2)/24
 "D/12" VALUE=((S+R)/2)/12



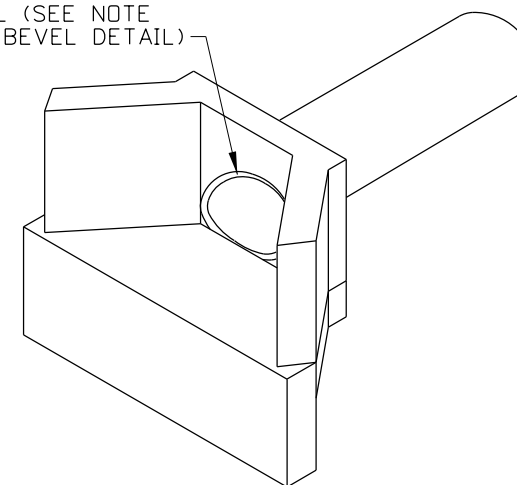
SECTION A-A

SECTION B-B

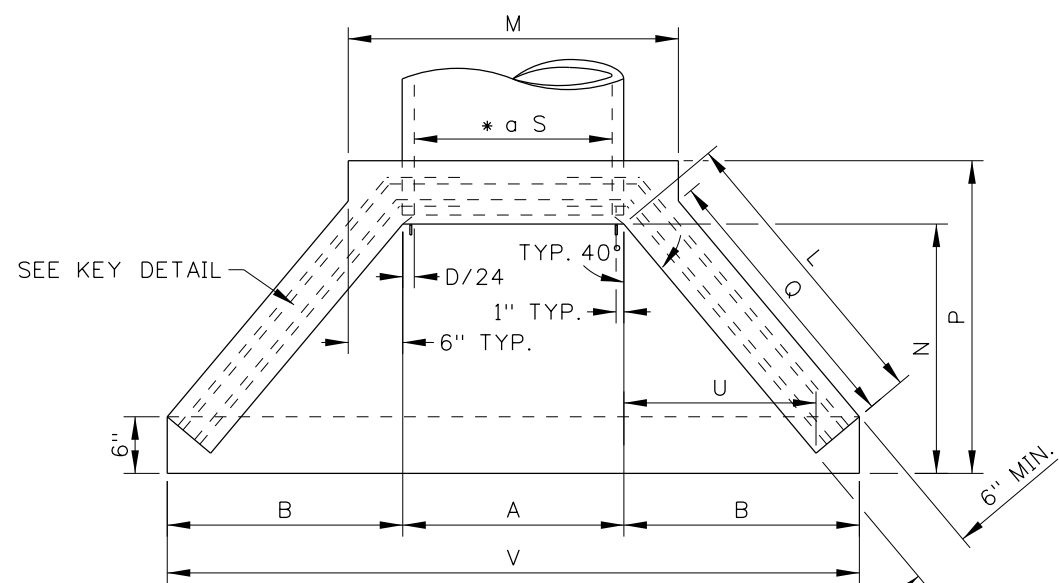


B-4 DETAIL

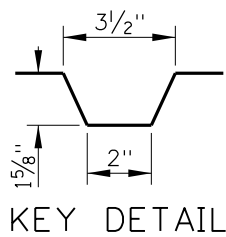
1:1 BEVEL (SEE NOTE NO. 5 & BEVEL DETAIL)



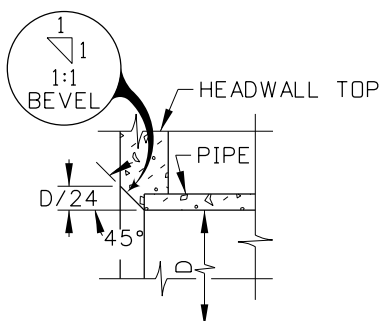
ISOMETRIC VIEW



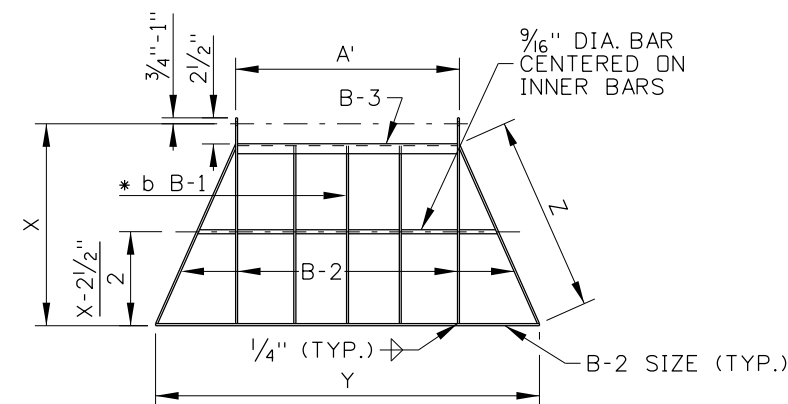
PLAN



KEY DETAIL



BEVEL DETAIL



* b BARS SHALL BE EQUALLY SPACED IN GRATE NOT TO EXCEED 8" CENTER TO CENTER OR LESS THAN 6" CENTER TO CENTER.

INLET GRATE DETAIL

| REVISIONS | | | | | | | |
|-----------|-------|-----|-----|-------|-----|-----|------|
| NO. | DATE | BY | NO. | DATE | BY | NO. | DATE |
| 1 | 10-69 | | 6 | 10-01 | MSM | | |
| 2 | 03-92 | MSM | 7 | 06-03 | MSM | | |
| 3 | 12-92 | TMR | 8 | 03-05 | MSM | | |
| 4 | 05-95 | MSM | | | | | |
| 5 | 04-99 | MSM | | | | | |

SCALES SHOWN ARE FOR 11" X 17" PRINTS ONLY
 CADD FILE NAME: 609-4_0305.dgn
 DRAWING DATE: AUGUST, 1968

IDAHO TRANSPORTATION DEPARTMENT



BOISE IDAHO

ORIGINAL SIGNED BY: LOREN THOMAS
 ASSISTANT CHIEF ENGINEER (DEVELOPMENT)
 ORIGINAL SIGNED BY: STEVEN HUTCHINSON
 CHIEF ENGINEER

STANDARD DRAWING

CONCRETE HEADWALL FOR ARCH PIPE CULVERT

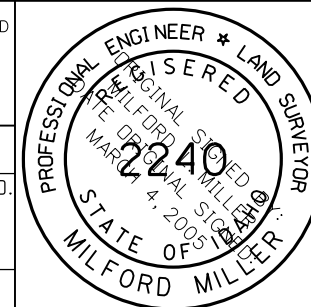
ORIGINAL STORED AT: ITD, Headquarters 3311 West State Boise, Idaho

English

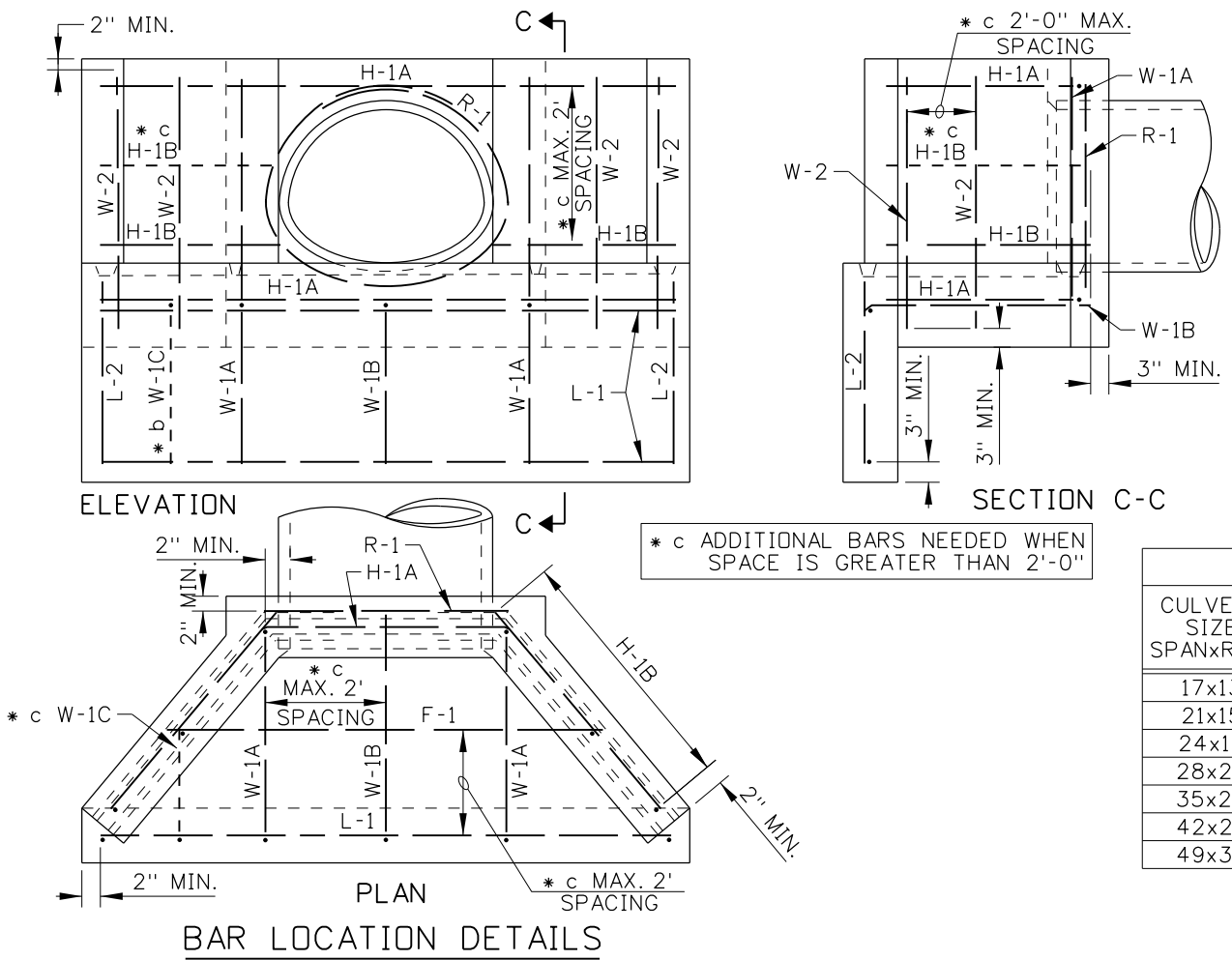
STANDARD DRAWING NO.

609-4

SHEET 1 OF 2



| METAL REINFORCEMENT TABLE | | | |
|---------------------------|---|----------|--------|
| MARK | LOCATION | BAR SIZE | SKETCH |
| F-1 | FLOOR | NO. 4 | |
| L-1 | TOP & BOTOM OF INLET LIP IN FLOOR | NO. 4 | |
| H-1A | HORIZ. IN TOP OF WING WALL & IN FLOOR BACK WALL | NO. 4 | |
| H-1B | HORIZ. IN WING WALL BETWEEN H-1As' | NO. 4 | |
| H-2 | VERT. IN BCKWL. WALL BETWEEN AROUND PIPE | NO. 4 | |
| W-1A | EACH SIDE OF PIPE IN BACKWALL, FLOOR, & INLET LIP | NO. 4 | |
| W-1B | IN FLOOR, & INLET LIP | NO. 4 | |
| W-1C | IN FLOOR, & INLET LIP | NO. 4 | |
| L-2 | VERTICAL IN FLOOR, & INLET LIP | NO. 4 | |
| W-2 | VERTICAL IN WING WALLS | NO. 4 | |



| CULVERT SIZE SPANxRISE | CONCRETE (C.Y.) | | | |
|------------------------|-----------------|-------|-----|-------|
| | WING & BCKWL. | FLOOR | LIP | TOTAL |
| 17x13 | 0.2 | 0.3 | 0.2 | 0.7 |
| 21x15 | 0.3 | 0.3 | 0.2 | 0.8 |
| 24x18 | 0.4 | 0.4 | 0.2 | 1.0 |
| 28x20 | 0.4 | 0.5 | 0.2 | 1.1 |
| 35x24 | 0.5 | 0.7 | 0.2 | 1.4 |
| 42x29 | 0.8 | 0.9 | 0.2 | 1.9 |
| 49x33 | 1.0 | 1.1 | 0.3 | 2.4 |

| CULVERT SIZE SPANxRISE | GRATE DIMENSION & MATERIALS TABLE | | | | | | | |
|------------------------|-----------------------------------|--------|--------|--------|-----------|-----------|-----------------|-------------|
| | IN INCHES | | | | | | | |
| | DIMENSIONS | | | | BAR SIZES | | | |
| | A' | * d X | Y | Z | B-1 | B-2 | B-3 | B-4 |
| 17x13 | 17 1/4 | 21 | 36 7/8 | 17 3/4 | 1x1/4 | 1 1/4x1/4 | 1 1/4x1 1/4x1/4 | 1x1/4x9 |
| 21x15 | 21 1/2 | 24 1/8 | 44 1/2 | 26 1/2 | 1x1/4 | 1 1/4x1/4 | 1 1/4x1 1/4x1/4 | 1x1/4x9 |
| 24x18 | 24 3/4 | 28 3/4 | 53 3/8 | 30 1/8 | 1x1/4 | 1 1/4x1/4 | 1 1/4x1 1/4x1/4 | 1x1/4x9 |
| 28x20 | 29 | 31 1/8 | 61 1/2 | 33 1/2 | 1x1/4 | 1 1/4x1/4 | 1 1/4x1 1/4x1/4 | 1x1/4x9 |
| 35x24 | 36 1/2 | 38 1/4 | 76 3/4 | 41 | 1x1/4 | 1 1/4x1/4 | 1 1/4x1 1/4x1/4 | 1x1/4x9 |
| 42x29 | 43 1/2 | 46 | 93 | 50 | 1 1/4x1/4 | 1 1/2x1/4 | 1 1/2x1 1/2x1/4 | 1 1/2x1/4x9 |
| 49x33 | 51 1/2 | 52 1/4 | 108 | 57 1/8 | 1 1/2x1/4 | 1 3/4x1/4 | 1 3/4x1 3/4x1/4 | 1 3/4x1/4x9 |

* d ALLOW 3/4"-1" EXTRA BAR LENGTH FOR HOLE FABRICATION

| HEADWALL DIMENSION TABLE | | | | | | | | | | | |
|--------------------------|------------------------|-----------|--------|--------|--------|--------|--------|--------|--------|--------|---------|
| CULVERT SIZE SPANxRISE | (S+R)/2/24 D/24 VALUES | IN INCHES | | | | | | | | | |
| | | A | B | H | L | M | N | P | Q | U | V |
| 17x13 | 5/8 | 18 1/4 | 21 1/2 | 22 1/4 | 26 1/4 | 30 1/4 | 22 1/4 | 28 7/8 | 24 | 16 7/8 | 61 1/4 |
| 21x15 | 3/4 | 23 3/8 | 23 3/8 | 24 1/2 | 29 1/4 | 34 1/2 | 24 1/2 | 31 1/4 | 27 | 18 3/4 | 69 1/4 |
| 24x18 | 7/8 | 26 1/8 | 26 1/8 | 27 3/4 | 33 1/2 | 37 3/4 | 27 3/4 | 34 5/8 | 31 3/8 | 21 1/2 | 78 |
| 28x20 | 1 | 28 | 28 | 30 | 36 3/8 | 42 | 30 | 37 | 34 1/4 | 23 3/8 | 86 |
| 35x24 | 1 1/4 | 31 3/4 | 31 3/4 | 34 1/2 | 42 1/4 | 49 1/2 | 34 1/2 | 41 3/4 | 40 | 27 1/8 | 101 |
| 42x29 | 1 1/2 | 36 1/2 | 36 1/2 | 40 | 49 1/2 | 57 | 40 | 47 1/2 | 47 3/8 | 31 3/4 | 118 |
| 49x33 | 1 3/4 | 40 1/8 | 40 1/8 | 44 3/8 | 55 1/8 | 64 1/2 | 44 3/8 | 52 1/8 | 53 | 31 3/4 | 132 3/4 |

| METAL REINFORCEMENT TABLE | | | | | | | | | | | | | | |
|---------------------------|----------------------------------|--------|---------|--------|---------|-------|---------|--------|---------|--------|---------|--------|----------|-------|
| BAR | NOMINAL PIPE SIZE DIAMETER (IN.) | | | | | | | | | | | | | |
| | 17x13 | | 21x15 | | 24x18 | | 28x20 | | 35x24 | | 42x29 | | 49x33 | |
| | NO. | LGTH. | NO. | LGTH. | NO. | LGTH. | NO. | LGTH. | NO. | LGTH. | NO. | LGTH. | NO. | LGTH. |
| F-1 | 1 | 40 1/2 | 1 | 48 | 1 | 54 | 1 | 60 | 1 | 70 | 1 | 82 | 1 | 96 |
| H-1A | 2 | 74 | 2 | 83 | 2 | 94 | 2 | 105 | 2 | 124 | 2 | 146 | 2 | 165 |
| H-1B | 2 | 25 | 2 | 30 | 4 | 34 | 4 | 38 | 4 | 44 | 4 | 52 | 4 | 58 |
| L-1 | 2 | 57 | 2 | 65 | 2 | 74 | 2 | 82 | 2 | 97 | 2 | 114 | 2 | 128 |
| L-2 | 2 | 19 | 2 | 19 | 2 | 19 | 2 | 19 | 2 | 19 | 2 | 19 | 2 | 19 |
| R-1 | 1 | 72 | 1 | 82 | 1 | 92 | 1 | 102 | 1 | 118 | 1 | 138 | 1 | 153 |
| W-1A | 2 | 61 1/2 | 2 | 67 1/2 | 2 | 74 | 2 | 79 1/2 | 2 | 87 1/2 | 2 | 98 1/2 | 2 | 107 |
| W-1B | 0 | N/A | 2 | 41 1/2 | 2 | 45 | 2 | 48 | 2 | 52 | 2 | 59 1/2 | 2 | 62 |
| W-1C | 0 | N/A | 1 | N/A | 1 | 32 | 1 | 33 1/2 | 1 | 36 | 1 | 39 | 2 | 40 |
| W-2 | 4 | 26 | 4 | 29 1/2 | 4 | 32 | 4 | 34 | 4 | 38 1/2 | 6 | 44 | 6 | 48 |
| TOT. WT. | 39 lbs. | | 46 lbs. | | 58 lbs. | | 64 lbs. | | 73 lbs. | | 90 lbs. | | 101 lbs. | |

NOTES

- THIS HEADWALL SHALL BE USED ONLY WHEN PROTECTED BY GUARDRAIL OR INSTALLED OUTSIDE THE CLEAR ZONE.
- CAST-IN-PLACE HEADWALLS SHALL CONFORM TO SECTION 609 - MINOR STRUCTURES, OF THE CURRENT ITD STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION.
- THE METAL REINFORCEMENT SHALL BE NO. 4 BARS. ALL REINFORCEMENT SHALL HAVE A MINIMUM CONCRETE COVER OF 2" AND 3" MINIMUM COVER IF CAST AGAINST EARTH.
- ALL EDGES TO HAVE 3/4" CHAMFER OR TOOLED EDGES.
- ALL PIPE CULVERTS WITH A CONCRETE HEADWALL SHALL HAVE THE INLET HEADWALLS BEVELED. USE ENTRANCE LOSS COEFFICIENT $K_e = 0.2$ FOR BEVELED ENTRANCES.
- THE METAL FOR THE GRATE SHALL MEET THE REQUIREMENTS OF ASTM A 36. WELDING OF THE METAL GRATE SHALL MEET THE REQUIREMENTS OF THE AMERICAN WELDING SOCIETY D1.1. GRATES FOR INLET HEADWALLS WILL BE REQUIRED ONLY WHEN SHOWN ON THE ROADWAY PLANS. GRATES NEED NOT BE PAINTED OR GALVANIZED.
- USE CONCRETE, METAL, OR PLASTIC PIPE WITH HEADWALL (CONCRETE PIPE SHOWN ON DRAWING).
- NOT TO SCALE.

| REVISIONS | | | | | | | |
|-----------|-------|-----|-----|-------|-----|-----|------|
| NO. | DATE | BY | NO. | DATE | BY | NO. | DATE |
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| 2 | 03-92 | MSM | 7 | 06-03 | MSM | | |
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IDAHO TRANSPORTATION DEPARTMENT
 BOISE IDAHO

ORIGINAL SIGNED BY: LOREN THOMAS
 ASSISTANT CHIEF ENGINEER (DEVELOPMENT)
 ORIGINAL SIGNED BY: STEVEN HUTCHINSON
 CHIEF ENGINEER

STANDARD DRAWING
 CONCRETE HEADWALL FOR ARCH PIPE CULVERT

English
 STANDARD DRAWING NO. 609-4
 SHEET 2 OF 2

ORIGINAL STORED AT: ITD, Headquarters 3311 West State Boise, Idaho