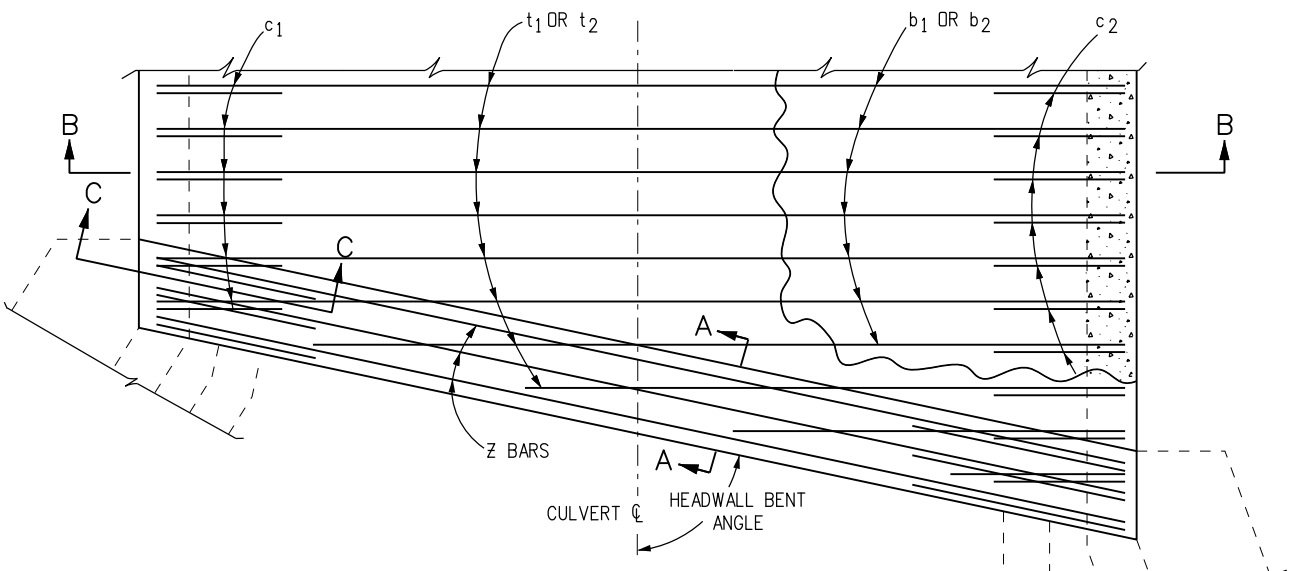
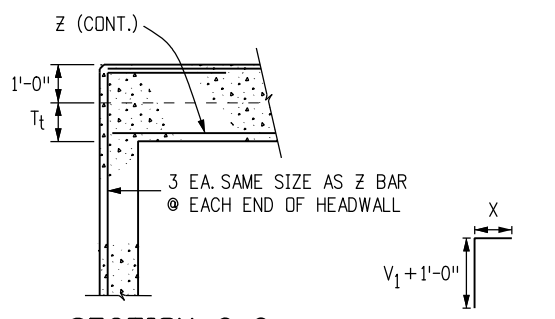


SECTION B-B

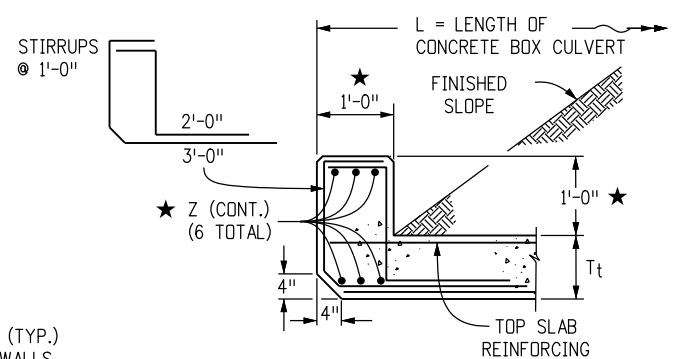


REINFORCING PLAN

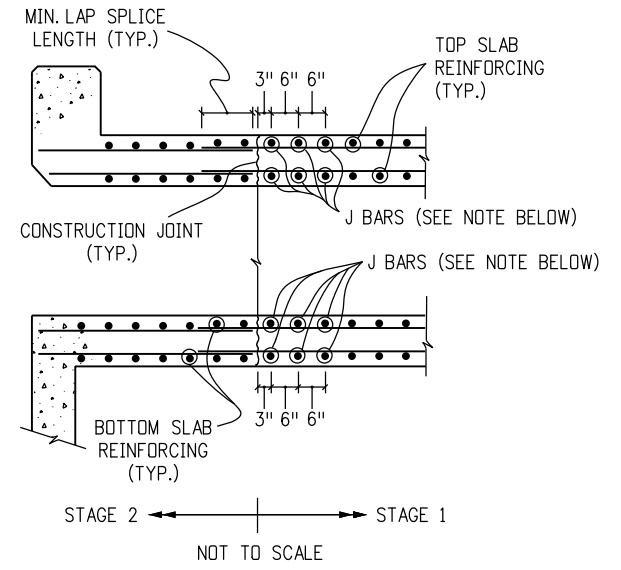
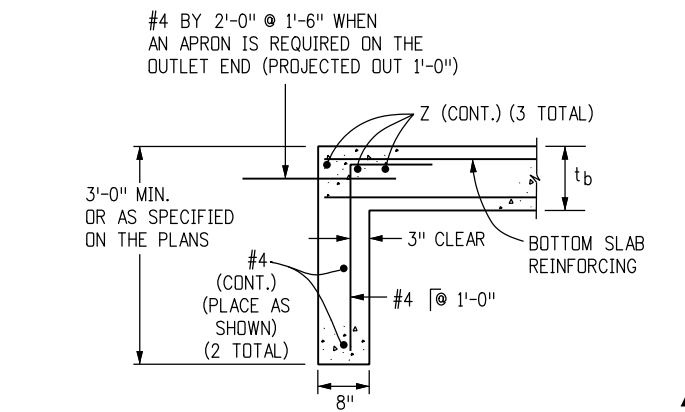
BAR SIZE (#)	EPOXY X (FT.-IN.)	BLACK X (FT.-IN.)
4	2-4	1-11
5	2-10	2-4
6	3-5	2-10
7	4-1	3-3
8	5-3	4-3
9	6-8	5-5



**SECTION C-C
HEADWALL CORNER REINFORCING DETAIL**



SECTION A-A



CONSTRUCTION JOINT DETAIL FOR STAGED CONSTRUCTION

NOTE: THIS DETAIL IS FOR CONSTRUCTION JOINTS INSTALLED PERPENDICULAR TO THE C OF THE BOX ONLY. THE CONTRACTOR CAN DESIGN AND INSTALL J BARS AT HIS EXPENSE TO SUPPORT TEMPORARY LIVE LOADS DURING STAGE 1 CONSTRUCTION. J BARS SHALL BE THE SAME SIZE AS THE TOP AND BOTTOM SLAB REINFORCING WHEN THERE ARE NO TEMPORARY LIVE LOADS TO SUPPORT.

GENERAL NOTES

- ALL CONCRETE SHALL BE CLASS D (BOX CULVERT).
- ALL CONSTRUCTION JOINTS SHALL BE THOROUGHLY CLEANED BEFORE FRESH CONCRETE IS PLACED.
- ALL CONSTRUCTION JOINTS NOT SHOWN ON THE PLANS SHALL BE CONSTRUCTED ONLY IF APPROVED BY THE ENGINEER.
- THE CONTRACTOR SHALL MAINTAIN THE STABILITY OF THE STRUCTURE DURING CONSTRUCTION.
- STRUCTURE EXCAVATION AND BACKFILL SHALL BE IN ACCORDANCE WITH STANDARD PLAN M-206-1.
- BACKFILL SHALL NOT BEGIN UNTIL TOP SLAB HAS REACHED DESIGN STRENGTH, f'c.
- SPLICE QUANTITIES FOR LONGITUDINAL AND TRANSVERSE BARS ARE NOT INCLUDED.
- REINFORCING STEEL SHALL BE GRADE 60.
- THE MINIMUM LAP SPLICE LENGTH FOR EPOXY COATED REINFORCING BARS SHALL BE:

BAR SIZE:	#4	#5	#6	#7	#8	#9	#10	#11
SPLICE LENGTH:	1'-3"	1'-7"	2'-5"	2'-10"	3'-8"	4'-8"	5'-11"	7'-3"

THE MINIMUM LAP SPLICE LENGTH FOR BLACK REINFORCING BARS SHALL BE:

BAR SIZE:	#4	#5	#6	#7	#8	#9	#10	#11
SPLICE LENGTH:	1'-1"	1'-4"	1'-7"	1'-11"	2'-6"	3'-1"	3'-11"	4'-10"

THE ABOVE SPLICE LENGTHS ARE FOR CLASS B SPLICES.

- ALL DIMENSIONS ARE PERPENDICULAR TO THE CENTERLINE OF THE BOX.
- WINGWALLS SHALL BE TIED TO CONCRETE BOX CULVERT IN ACCORDANCE WITH STANDARD PLAN M-601-20.
- ALL TRANSVERSE REINFORCING SHALL BE NORMAL TO THE CENTERLINE OF THE BOX.
- THE FILL HEIGHT IS THE DISTANCE MEASURED FROM THE TOP OF THE TOP SLAB TO THE TOP OF PAVEMENT.
- ALL EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED 3/4".
- FOR FILL HEIGHTS LESS THAN 2 FT. A WATERPROOFING MEMBRANE SHALL BE PROVIDED FOR THE TOP OF THE TOP SLAB AND 18 INCHES DOWN FROM THE TOP OF THE EXTERIOR WALLS.
- FOR FILL HEIGHTS LESS THAN 2 FT, THE d1 BARS FOR THE BOTTOM MAT OF THE TOP SLAB SHALL BE AS FOLLOWS:

S	6	8	10	12, 14, 16, 18, 20
BAR SIZE:	#5	#6	#6	#5
SPACING	1'-0"	1'-0"	0'-6"	0'-6"

DESIGN DATA: 7TH EDITION, 2014, OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS
 RATING DATA: 2ND EDITION, 2011, OF THE AASHTO MANUAL FOR BRIDGE EVALUATION

f_y = 60,000 psi,
 f'c = 4,500 psi,

LOADING DATA:

- LIVE LOAD = AASHTO LRFD, HL-93 TRUCK, HL-93 TANDEM, COLORADO PERMIT TRUCK, AND NRL
- DEAD LOAD CASE 1: VERTICAL EARTH LOAD = 120 LBS./CU. FT. HORIZONTAL EARTH LOAD = 30 LBS./CU. FT.
- DEAD LOAD CASE 2: VERTICAL EARTH LOAD = 120 LBS./CU. FT. HORIZONTAL EARTH LOAD = 60 LBS./CU. FT.
- THRUST IS NOT CONSIDERED IN THIS STANDARD, I.E. THRUST = 0.
- WEARING SURFACE - 12 INCHES THICK CONCRETE PAVEMENT.
- DEAD LOAD - TYPE 7 BARRIER.
- EXTREME HEADWATER TO DEPTH RATIO IS IN ACCORDANCE WITH THE CDDT DRAINAGE MANUAL.
- EXTREME HEADWATER TO DEPTH RATIO WAS INCLUDED IN THE DESIGN BUT EXCLUDED FROM THE RATINGS AS PER THE AASHTO MANUAL FOR BRIDGE EVALUATION.
- LIVE LOAD SURCHARGE ON EXTERIOR WALLS = 2 FT. OF EARTH

★ IF HEADWALL MOUNT GUARDRAIL IS USED (SEE STANDARD PLAN M-606-1, SHEET 20, AND THE INFORMATION BELOW):

- ALL REINFORCING STEEL SHALL BE ACCORDING TO THIS BOX CULVERT PLAN.
- ANY SPECIAL DESIGN FOR STIRRUPS WILL NOT BE MEASURED AND PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE WORK.
- HEADWALL DIMENSION AND CONCRETE QUANTITY SHALL BE ACCORDING TO STANDARD PLAN M-606-1, SHEET 20.
- POST ANCHORS SHALL BE PROVIDED ACCORDING TO STANDARD PLAN M-606-1, SHEET 20.
- POST ANCHORS AND CONCRETE FOR HEADWALL MOUNT OF GUARDRAIL WILL NOT BE MEASURED AND PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE WORK.
- POST ANCHORS WHEN REQUIRED AND ENCASED IN HEADWALL CONCRETE, SHALL CONFORM TO ASTM A 36 OR AASHTO M 169 STEEL.

18. SEE M-603-3 FOR PRECAST CONCRETE BOX CULVERT DETAILS.

Computer File Information

Creation Date: 07/31/19	(R-X)
Designer Initials: JBE	(R-X)
Last Modification Date: 07/31/19	(R-X)
Detailer Initials: LTA	(R-X)
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	(R-X)

Sheet Revisions

Date:	Comments

Colorado Department of Transportation
 2829 West Howard Place
 CDDT HQ, 3rd Floor
 Denver, CO 80204
 Phone: 303-757-9021 FAX: 303-757-9868
 Project Development Branch **JBK**

**SINGLE CONCRETE BOX
 CULVERT (CAST-IN-PLACE)**
 Issued by the Project Development Branch: July 31, 2019

**STANDARD PLAN NO.
 M-601-1**
Standard Sheet No. 1 of 2
 Project Sheet Number:

SINGLE CONCRETE BOX CULVERT DIMENSIONS, QUANTITIES & RATING FACTORS (EXCLUDING HEADWALL & TOEWALL QUANTITIES)

BOX SIZE		FILL HEIGHT ALLOWED		SLAB & WALL THICKNESS (INCHES)			BAR SIZES						DIMENSIONS					QUANTITIES			RATING FACTORS							
S	R	HT.	WIDTH	FT-FT	T _t	T _b	TW	t1*	b1	t2	b2	w1*	w2	c1*	c2	d1▲	h1	h2	v1	v2	v3	CONCRETE	REBAR STL	WATERPROOFING	HL-93 INVENTORY	HL-93 OPERATING	COLORADO PERMIT	NRL VEHICLE
FT	FT	FT-IN	FT-IN	FT-FT	T _t	T _b	TW	#	#	#	#	#	#	#	#	NO.	FT-IN	FT-IN	FT-IN	FT-IN	FT-IN	CY/LF	LBS/LF	SY/LF				
6	7	8-8	7-8	< 2	10	10	10	4	6	6	4	5	5	5	5	64	3-5	4-4	7-7	3-1	1-11	0.905	215	1.185	1.23	1.59	2.03	2.09
		8-4.5	7-8	2 TO 8	8.5	8	10	4	5	5	4	5	5	5	5	64	3-10	4-4	7-6	2-11	1-9	0.823	199	1.67	1.67	2.17	2.51	2.58
		8-5	7-8	8 TO 15	8.5	8.5	10	4	5	5	4	5	5	5	5	64	3-8	2-4	7-6	3-0	1-9	0.834	190	◆	◆	◆	◆	◆
		8-5	7-8	15 TO 20	8.5	8.5	10	4	5	5	4	5	5	5	5	64	3-8	2-4	7-6	3-0	1-9	0.834	190	◆	◆	◆	◆	◆
8	6	7-9	9-8	< 2	11	10	10	4	7	7	4	5	5	5	68	4-9	2-4	6-8	3-1	1-11	0.997	251	1.407	1.10	1.43	1.65	1.63	
		7-6	9-8	2 TO 8	8.5	9.5	10	4	6	6	4	5	5	5	66	4-8	2-4	6-6	3-1	1-10	0.907	220	1.59	1.59	2.07	2.39	2.46	
		7-6	9-8	8 TO 15	8.5	9.5	10	4	6	6	4	5	5	5	66	3-7	2-4	6-6	3-1	1-10	0.907	216	◆	◆	◆	◆	◆	
		7-6	9-8	15 TO 20	8.5	9.5	10	4	6	6	4	5	5	5	66	3-7	2-4	6-6	3-1	1-10	0.907	216	◆	◆	◆	◆	◆	
		9-9.5	9-8	< 2	11.5	10	10	4	7	7	4	5	5	5	76	5-8	5-4	8-9	3-1	1-11	1.135	287	1.407	1.07	1.38	1.60	1.58	
		9-7	9-8	2 TO 8	9	10	10	4	6	6	4	5	5	5	74	4-8	2-4	8-7	3-1	1-11	1.061	240	1.61	1.61	2.09	2.54	2.57	
	8	10	9-7	9-8	8 TO 15	9	10	10	4	6	6	4	5	5	74	3-7	2-4	8-7	3-1	1-11	1.061	235	◆	◆	◆	◆	◆	
			9-7	9-8	15 TO 20	9	10	10	4	6	6	4	5	5	74	3-7	2-4	8-7	3-1	1-11	1.061	235	◆	◆	◆	◆	◆	
			11-10	9-8	< 2	11.5	10.5	10	4	7	7	4	5	5	84	3-5	2-4	10-9	3-2	2-0	1.274	285	1.407	1.12	1.46	1.69	1.66	
			11-7	9-8	2 TO 8	9	10	10	4	6	6	4	5	5	82	5-6	2-4	10-7	3-1	1-11	1.184	262	1.61	1.61	2.09	2.52	2.56	
			11-7	9-8	8 TO 15	9	10	10	4	6	6	4	5	5	82	4-6	2-4	10-7	3-1	1-11	1.184	258	◆	◆	◆	◆	◆	
			11-9	9-11	15 TO 20	10	11	11.5	4	6	6	4	6	6	6	85	4-7	2-5	10-8	3-1	1-11	1.353	302	◆	◆	◆	◆	◆
10	6	7-11.5	11-8	< 2	12.5	11	10	4	8	8	4	5	5	87	5-8	2-7	6-10	3-2	2-0	1.217	321	1.630	1.05	1.36	1.49	1.48		
		7-7	11-8	2 TO 10	9	10	10	4	6	6	4	5	5	72	5-5	2-7	6-7	3-1	1-11	1.055	246	1.25	1.25	1.62	1.88	1.84		
		7-8	11-8	10 TO 15	10	10	10	4	6	6	4	5	5	72	4-2	2-7	6-8	3-1	1-11	1.091	242	◆	◆	◆	◆	◆		
		8-1	11-10	15 TO 20	13	12	11	4	6	6	4	5	5	75	4-7	2-9	6-11	3-3	2-1	1.320	251	◆	◆	◆	◆	◆		
		9-11.5	11-8	< 2	12.5	11	10	4	9	9	4	5	5	95	5-8	2-7	8-10	3-2	2-0	1.340	383	1.630	1.02	1.32	1.44	1.43		
		9-7.5	11-8	2 TO 10	9.5	10	10	4	6	6	4	5	5	80	5-5	2-7	8-7	3-1	1-11	1.196	265	1.21	1.21	1.57	1.82	1.78		
	8	10	9-8	11-8	10 TO 15	10	10	10	4	6	6	4	5	5	80	4-3	2-7	8-8	3-1	1-11	1.214	261	◆	◆	◆	◆	◆	
			10-0	12-0	15 TO 20	12	12	12	4	6	6	4	5	5	83	4-7	2-10	8-10	3-3	2-1	1.481	271	◆	◆	◆	◆	◆	
			12-0	11-8	< 2	12.5	11.5	10	4	9	9	4	5	5	103	6-7	2-5	10-10	3-3	2-1	1.481	423	1.630	1.07	1.39	1.51	1.50	
			11-7.5	11-8	2 TO 10	9.5	10	10	4	6	6	4	5	5	88	5-5	2-7	10-7	3-1	1-11	1.319	285	1.16	1.16	1.51	1.74	1.71	
			11-9	11-10	10 TO 15	10	11	11	4	6	6	4	5	5	91	4-4	2-8	10-8	3-2	1-11	1.446	285	◆	◆	◆	◆	◆	
			12-0.5	12-0	15 TO 20	12	12.5	12	4	6	6	5	5	5	91	4-7	2-10	10-10	3-4	2-6	1.648	315	◆	◆	◆	◆	◆	
12	6	8-1.5	13-8	< 2	13.5	12	10	4	9	9	4	6	6	97	5-5	3-0	6-11	3-7	2-1	1.446	433	1.852	1.03	1.33	1.42	1.39		
		7-7.5	13-8	2 TO 8	9.5	10	10	4	7	7	4	6	6	78	6-4	3-0	6-7	3-5	1-11	1.193	378	1.27	1.27	1.65	1.89	1.84		
		7-9	13-8	8 TO 12	9.5	11.5	10	4	7	7	4	6	6	78	5-1	3-0	6-7	3-7	2-0	1.256	333	2.28	2.28	2.95	3.25	3.54		
		8-0.5	13-10	12 TO 16	12	12.5	11	4	7	7	4	6	6	81	5-0	3-1	6-10	3-7	2-0	1.453	339	◆	◆	◆	◆	◆		
		8-0.5	14-0	16 TO 20	12	12.5	12	5	7	7	5	6	6	81	5-2	3-2	6-10	3-8	2-6	1.503	361	◆	◆	◆	◆	◆		
		10-1.5	13-8	< 2	13.5	12	10	4	9	9	4	6	6	105	6-6	3-0	8-11	3-7	2-1	1.569	462	1.852	1.00	1.29	1.37	1.35		
	8	10	9-8	13-8	2 TO 8	9.5	10.5	10	4	7	7	4	6	6	86	5-1	3-0	8-7	3-6	1-11	1.337	355	◆	◆	◆	◆	◆	
			9-9.5	13-8	8 TO 12	10	11.5	10	4	7	7	4	6	6	86	5-5	3-0	8-8	3-7	2-0	1.401	358	2.32	3.01	3.31	3.60		
			9-9.5	13-10	12 TO 16	10	11.5	11	4	7	7	4	6	6	89	5-0	3-1	8-8	3-7	2-0	1.461	360	◆	◆	◆	◆	◆	
			10-0.5	14-0	16 TO 20	12	12.5	12	5	7	7	4	6	6	89	5-1	3-1	8-10	3-7	2-1	1.651	385	◆	◆	◆	◆	◆	
			12-2	13-8	< 2	13.5	12.5	10	4	9	9	4	6	6	113	7-10	6-3	10-11	3-8	2-2	1.714	513	1.852	1.04	1.35	1.43	1.41	
			11-8	13-8	2 TO 8	9.5	10.5	10	4	7	7	4	6	6	94	6-4	3-0	10-7	3-6	1-11	1.461	385	◆	◆	◆	◆	◆	
10	10	11-9.5	13-8	8 TO 12	10	11.5	10	4	7	7	4	6	6	94	5-1	3-0	10-8	3-7	2-0	1.524	379	2.08	2.70	2.97	2.16			
		11-9.5	13-10	12 TO 16	10	11.5	11	5	7	7	4	7	7	97	5-1	3-2	10-8	4-0	2-0	1.597	456	◆	◆	◆	◆	◆		
		12-1	14-0	16 TO 20	12.5	12.5	12	5	7	7	4	7	7	97	5-2	3-3	10-10	4-0	2-1	1.821	462	◆	◆	◆	◆	◆		
		8-3.5	15-8	< 2	14	13.5	10	4	9	9	4	6	6	107	5-10	3-5	6-11	3-9	2-0	1.700	479	2.074	1.10	1.43	1.48	1.41		
		7-8	15-8	2 TO 6	9.5	10.5	10	4	8	8	4	7	7	84	7-3	3-5	6-7	3-11	1-11	1.337	460	◆	◆	◆	◆	◆		
		7-8.5	15-8	6 TO 8	9.5	11	10	4	8	8	4	7	7	84	5-9	3-5	6-7	3-11	2-0	1.362	448	◆	◆	◆	◆	◆		
14	6	7-10.5	15-8	8 TO 10	10.5	12	10	4	8	8	4	7	7	84	5-9	3-5	6-8	4-0	2-1	1.458	450	◆	◆	◆	◆	◆		
		7-11.5	15-8	10 TO 12	11	12.5	10	4	8	8	4	7	7	84	5-9	3-5	6-9	4-1	2-1	1.507	452	◆	◆	◆	◆	◆		
		8-1.5	15-8	12 TO 14	12	13.5	10	4	8	8	4	7	7	84	5-9	3-5	6-10	4-2	2-2	1.603	453	◆	◆	◆	◆	◆		
		8-1.5	15-10	14 TO 18	12	13.5	11	5	8	8	5	7	7	87	5-9	3-6	6-10	4-2	2-7	1.654	500	◆	◆	◆	◆	◆		
		10-4	15-8	< 2	14	14	10	4	9	9	4	6	6	115	5-10	3-6	8-11	3-9	2-0	1.848	502	2.074	1.12	1.46	1.60	1.52		
		9-8	15-8	2 TO 6	9.5	10.5	10	4	8	8	4	7	7	92														