TASK ORDER NO# 22-37

TASK ORDER NAME: S-Curve Replacement University Line

PROJECT CODE: SGR385 40-7385.68912

This is Task Order No. 22-37 to the On Call Maintenance Contract entered into by and between Utah Transit Authority (UTA) and Stacy and Witbeck, Inc. (Contractor) as of February 2nd, 2021.

This Task Order is part of the On Call Maintenance Contract and is governed by the terms thereof.

The purpose of this Task Order is to specifically define the scope, schedule, lump sum price, and other terms applicable to the work identified herein.

UTA and Contractor hereby agree as follows:

1.0 SCOPE OF SERVICES

The scope of work for the Task Order #22-37 is hereby attached and incorporated into this Task Order.

2.0 SCHEDULE

The Substantial Completion Date for this Task December 31st, 2022. The Final Acceptance Date for this Task is December 31st, 2022.

3.0 LUMP SUM PRICE

The price for this task order is a not to exceed $5,326,888.00. Invoices will be billed on monthly basis for work completed to date.

4.0 APPLICABILITY OF FEDERAL CLAUSES

This Task Order does ☒ does not ☐ [Check Applicable] include federal assistance funds which requires the application of the Federal Clauses appended as Exhibit D to the On Call Maintenance Contract.

IN WITNESS WHEREOF, this Task Order has been executed by UTA and the Contractor or its appointed representative

UTAH TRANSIT AUTHORITY:

By: _____
Jay Fox, Executive Director Date
> $100,000

By: _____
Mary DeLoretto, Chief Service Development Ofc. Date
< 100,000

By: _____
Dave Hancock, Director of Capital Construction Date
< $50,000

By: _____
Kyle Stockley, Project Manager Date
< $10,000

DocuSigned by:
Mike Bell
70E33A415BA44F6...
Legal Review

Procurement Review

STACY AND WITBECK, INC.:

By: DocuSigned by: Collin Christensen ACA3AB62608B4E2...

Date: 3/22/2022

Stacy and Witbeck

February 4, 2022 On Call Services

Mr. Kyle Stockley
Rail Infrastructure Project Manager
Utah Transit Authority
2264 South 900 West
South Salt Lake City, UT 84119

Reference: On-Call Transit Infrastructure Construction, Maintenance and Repair
Project No: 20-03349VW

Subject: 22-611 – S-Curve Replacements and New Direct Fixation Slab on Grade

Dear Kyle:

We are pleased to provide pricing to procure and install new rail and direct fixation fasteners on a new slab on grade and remove the existing embedded track slab (track slab only, no infill) from approximate Station 76+50 to 91+00 on both the Westbound and Eastbound tracks on the University LRT Line. SWI anticipates this scope or work will take approximately 3 months of continuous uninterrupted work to complete while maintaining single track operations.

Material lead times especially for the Precurved and Restraining Rail are very tight if we are to meet the Summer 2022 installation window. SWI believes based on current quoted lead times from suppliers, that all materials can be delivered in time to meet the installation window. But, for this to happen, execution of this task order or notice to proceed must be expedited so material orders can be placed. Also, review of shop drawings, must be completed within 5 days of submittal to meet project delivery requirements.

SWI requests UTA to validate the track design of the existing as-built drawings along with the new direct fixation slab on grade including an IFC Design set showing the details and design to be followed. The provided details can be used for a basis of design, but SWI requires UTA to provide final design for construction of this scope of work. Also, please confirm that no Emergency Guardrail needs to be added due to the track changing from Embedded to Direct Fixation.

1958 West North Temple St.
Salt Lake City, UT 84116
t: 801-666-7840 f: 801-432-7489

Exclusions:

- Railroad Flagging, EIC, or Maintainers
- Manual Operation of any Hand Throw Switch Machines during Single Track Operations
- Sales Tax on Permanent Materials
- OCS Power Down and Grounding
- OCS Section Insulators or Disconnects
- Modifications to OCS or Train Signal System
- Insulated Joint Replacements or Track Circuit Replacements
- Removal and replacement of infill concrete
- P.E. Stamped Drawings
- Utility Relocations of any kind
- Design of the new Direct Fixation Slab and Grade and Reinforcing Steel
- Over-Excavation and Grade Stabilization of Existing Soils
- Geometry Car
- In-Line UT Testing
- Rail Grinding
- Stray current controls or mitigation
- Track to Earth Testing
- Design allowances or design progression scope increases beyond Drainage Item.
- Emergency Guardrail

Clarifications:

- Please see detailed list of each bid item below
- The unit costs for each bid item includes the costs of insurance, bond, and risk at the agreed upon rates.
- The scope of work is inclusive of only the items and scope that are listed below. Any other items of work or changes to the below scope will need to be repriced.
- New top of rail elevation, track alignment, and superelevation will match the existing as-built design provided by UTA.
- SWI assumes that UTA will isolate and deactivate the OCS System over the work area at no cost to SWI.
- See SWI Provided Layout drawing for assumed scope and project limits.
- Price is valid for 30 days from date submitted due to rail material volatility.

Summary of Costs and Scope for each item:

Bid Item 1000 – Field Engineering & Project Controls - 1.00 LS - Total of $664,868.00 - This bid item includes Stacy and Witbeck field support from field engineers and additional out of town

superintendents to manage construction. This item also includes office manager time for payroll and accounts payable and estimating time. There are also two laydown inspections for the precurved rail and restraining rail included.

Bid Item 2000 – Safety Program & Administration - 1.00 LS - Total of $123,506.00 - This bid item includes cost of safety officer, safety officer pickup and cell phone, and safety supplies and drug tests.

Bid Item 3000 – QC Program & Testing – 1 LS – Total $120,721.00 – This bid item includes the cost of for material testing and inspection along with the cost of the quality control manager, vehicle, and cell phone.

Bid Item 4000 – Permits and Fees – 1 LS – Total $1,282.00 – This bid item includes the cost of fees on Noise Permits, Excavation Permits, and Traffic Control Permits

Bid Item 5000 – Traffic and Pedestrian Control – 1 LS – Total $133,442.00 – This bid item includes the cost to provide traffic control to do lane closures, re-route traffic as needed to complete the work, message boards before and during construction, and regular site maintenance and inspections.

Bid Item 6000 – Key Personnel Travel & Subsistence – 1 LS – Total $136,791.00– This bid item includes cost to provide travel arrangements for key/specialized personnel, as well as subsistence for those personnel for the duration of the work and their wage overscale amount.

Bid Item 7000 – Railroad Protective Liability Insurance – 1 LS – Total $44,407.00– This bid item includes the insurance premium for Stacy and Witbeck to obtain Railroad Protective Liability Insurance for year 2022 on the On-Call Transit Infrastructure Construction, Maintenance and Repair project.

Bid Item 8000 – Survey - 1 LS – Total $43,575.00 – This bid item includes the cost to survey the existing track and provide layout for the new track construction.

Bid Item 10000 – Mobilization – 1 LS – Total $59,335.00 – This bid item includes the cost for mobilizing heavy equipment to and from the project site, sanitary facilities, dumpsters, and final project cleanup.

Bid Item 15000 – Procure & Weld Stick Rail- No Precurved – 1,976 TF – Total $227,240.00 – This bid item includes the cost to procure, unload and thermite weld the 115 RE HH 80 FT Sticks of rail that are not precurved. This is all the rail outside the limits of the restraining rail on curves 137 and 239. Also, since all the track outside for curves 137 and 239 are over a 280 FT radius, the gauge will stay constant at 4’ 8 ½”.

Bid Item 16000 – Procure & Weld Precurved Rail and Restraining Rail – 924 TF – Total $317,856.00 – This bid item includes the cost to procure, unload and thermite weld the 115 RE HH Precurved Rail and the procure and unload the restraining rail. This is all the rail for curves 137 and 239 and the restraining rail will now extend 13 feet past the point of tangent to match UTA updated design requirements for the Airport Trax Project. Also, since both curves are under a 280 FT radius, the gauge will widen the 4' 8 ¾" through the body of the curves (SC to CS points) and transition back to standard 4' 8 ½" gauge through the curve's spirals.

Bid Item 20000 – Direct Fixation Plates- Procure & Unload- No Restraining Rail – 1,976 TF – Total $276,640.00 – This bid item includes the cost to procure and unload **E-Clip Direct Rail Fasteners** similar to the Sound Transit Drawings attached. E-Clip Fasteners were selected over UTA's Standard Fastclip Fasteners due to cost, lead time, and there is no restraining rail Fastclip DF Fastener available. SWI has bid the DF Fasteners to include one 1/8" HDPE Shim to be left in place with the Fastener along with two epoxy coated inserts. DF Fasteners outside of curves 137 and 239 will either be spaced at 30" or 27" OC. Due to the steep grades throughout this project, the lowest being 4.4% and the majority of it being at 7% grade, along with the tighter (under 1000 FT radius) curves outside of 137 and 239 all being in compound curves (Eastbound: Curve 138 (389.25 FT Radius), Connects directly to 139 (753.25 FT Radius), which then goes directly to 140 (383.5 FT Radius) & Westbound: Curve 240 (373.75 FT Radius), Connects directly to 241 (737.75 FT Radius), which then goes directly to 242 (368 FT Radius)), SWI has bid all the curves being under 755 FT radius as having DF Fastener Spacing of 27". All Tangent track and curves over 755 FT Radius will have a fastener spacing of 30" OC.

Bid Item 21000 – Direct Fixation Plates- Procure & Unload- Precurved Rail with Restraining Rail – 924 TF – Total $196,812.00 – This bid item includes the cost to procure and unload **E-Clip Direct Rail Fasteners and Restraining Rail Fasteners** similar to the Sound Transit Drawings attached. E-Clip Fasteners were selected over UTA's Standard Fastclip Fasteners due to cost, lead time, and there is no restraining rail Fastclip DF Fastener available. DF Fasteners inside of curves 137 and 239 will be spaced at 24" OC. SWI has bid the DF Fasteners to include one 1/8" HDPE Shim to be left in place with the Fastener along with two epoxy coated inserts.

Bid Item 35000 – Demo Embedded Track – 2,900 TF – Total of $785,900.00 - This bid item includes the removal of all existing embedded track slab and rail from approximately Station 76+50 to 91+00 on both the Westbound and Eastbound tracks. SWI has bid this removal item as the track slab being 16" deep on average based on the as-built details.

Bid Item 55000 – Guideway Excavation – 430 CY – Total of $45,580.00 – This bid item includes cost to excavate under the existing track slab footprint an additional 6" to allow for the new DF Slab on Grade and aggregate base.

Bid Item 60000 – Direct Fixation Slab on Grade – 2,900 TF – Total of $823,600.00 - This bid item includes subgrade preparation, 4" of new aggregate base (572 Tons), supply and installation of epoxy coated rebar (bid at 150#/CY- 96,750# Total), Installation of 1" or ¾"

expansion joints with smooth dowels (100 FT Max. Spacing), concrete placement for Westbound and Eastbound track sections (bid as 9" Thick Slab on Grade- 6000 PSI Concrete with superplasticizer, 645 CY Total), ½" preformed joint filler between retainer curb and existing infill, forming and pouring a 4 inch wide infill retainer curb with epoxy rebar (wet stab #5 rebar dowels on 2 FT centers into slab on grade and then tie a single continuous #4 rebar full length of curb), and cleaning and sealing joints. **Final design is still needed for the slab, but these are the bidding assumptions that SWI has made. Any changes to design and quantities will be delt with once final design is received from UTA.**

Bid Item 61000 – Construct Direct Fixation Track, Poured into Slab on Grade – 1,976 TF – Total of $511,784.00 - This bid item includes the cost to distribute rail, distribute fasteners and OTM, construct the DF Track prior to slab on grade placement, final line and grade the track, and destress and reclip the Direct Fixation Trackwork after the DF Slab on Grade has been placed and cured. SWI has bid the DF Track to be poured into the slab on grade to expedite the installation process and not have to form and pour DF plinths. This will allow the existing top of rail elevation to remain the same, reduce excavation quantity, and keep the shutdown as short as possible. SWI also believes that the slab on grade can be finished with the DF Fasteners in place due to the existing infill being in place and being able to finish the 8 FT wide slab from both sides from the infill. This item has installation all of the DF E-Clip Fasteners at 30" OC.

Bid Item 62000 – Construct DF Track, Precurved with Restraining Rail, Poured into Slab on Grade – 924 TF – Total of $425,040.00 - This bid item includes the cost to distribute precurved rail and restraining rail, distribute fasteners and OTM, construct the DF Track prior to slab on grade placement, final line and grade the track, installation of the restraining rail, and destress and reclip the Direct Fixation Trackwork after the DF Slab on Grade has been placed and cured. SWI has bid the DF Track to be poured into the slab on grade to expedite the installation process and not have to form and pour DF plinths. This will allow the existing top of rail elevation to remain the same, reduce excavation quantity, and keep the shutdown as short as possible. SWI also believes that the slab on grade can be finished with the DF Fasteners in place due to the existing infill being in place and being able to finish the 8 FT wide slab from both sides from the infill. This item has installation of all of the DF E-Clip Fasteners at 24" OC.

Bid Item 70000 - Rail Salvage Credit - 122.00 TONS - Total of $29,646.00 - This bid item includes the credit price for the existing rail that will be removed from the existing curves. Salvage price is based on current scrap pricing from Western Metals Recycling.

Bid Item 100000 - Fee (7.5%) - 1.00 LS - Total of $368,155.00 - This is the agreed to CMGC fee that is part of the new On Call Services Contract on the above bid items.

Bid Item 200000 - Drainage Provisional Sum for Low End - 1.00 PS - Total of $50,000.00 - This provisional sum item will be billed on a time and material basis plus risk, fee, bond, and insurance to construct a new drainage/catch basin system at the new DF slab elevation to collect the runoff coming down the UTA Guideway.

Stacy and Witbeck

The total price for this scope of work is **$5,326,888.00.**

Please contact me with questions or concerns.

Sincerely,
Stacy and Witbeck, Inc.

Collin Christensen
Project Manager

1958 West North Temple St.
Salt Lake City, UT 84116
t: 801-666-7840 f: 801-432-7489

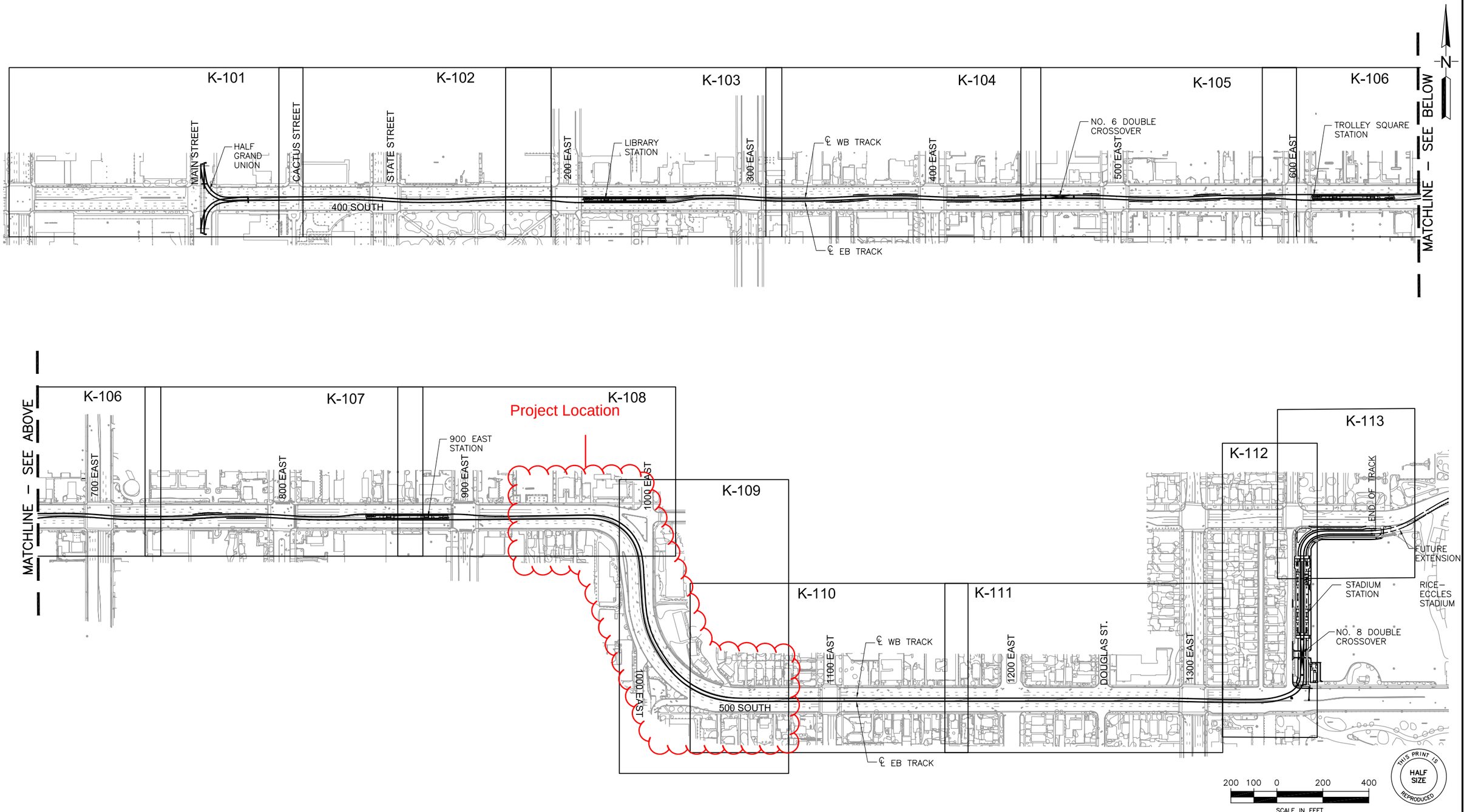
02/02/2022 12:25
22-611-2-R2 S-Curve Replacement- DF SOG R2
*** Moran, Mike, MM **BID TOTALS**

Biditem	Description	Quantity	Units	Unit Price	Bid Total
1000	Field Engineering & Project Controls	1.000	LS	664,868.00	664,868.00
2000	Safety Program & Administration	1.000	LS	123,506.00	123,506.00
3000	QC Program & Testing	1.000	LS	120,721.00	120,721.00
4000	Permits & Fees	1.000	LS	1,282.00	1,282.00
5000	Traffic & Pedestrian Control	1.000	LS	133,442.00	133,442.00
6000	Key Personnel Travel & Subsistence	1.000	LS	136,791.00	136,791.00
7000	Railroad Protective Liability Insurance	1.000	LS	44,407.00	44,407.00
8000	Survey	1.000	LS	43,575.00	43,575.00
10000	Mobilization	1.000	LS	59,335.00	59,335.00
15000	Procure & Weld Stick Rail- No Precurved	1,976.000	TF	115.00	227,240.00
16000	Procure & Weld PC & Rest. Rail	924.000	TF	344.00	317,856.00
20000	DF Plates- Procure & Unload- No RR	1,976.000	TF	140.00	276,640.00
21000	DF Plates- Procure & Unload- PC & RR	924.000	TF	213.00	196,812.00
35000	Demo Embedded Track	2,900.000	TF	271.00	785,900.00
55000	Guideway Excavation	430.000	CY	106.00	45,580.00
60000	DF Slab on Grade	2,900.000	TF	284.00	823,600.00
61000	Construct DF Track, Poured into Slab on Grade	1,976.000	TF	259.00	511,784.00
62000	Construct DF Track- PC with RR, Poured into SOG	924.000	TF	460.00	425,040.00
70000	Rail Salvage Credit	122.000	TONS	-243.00	-29,646.00
		Subtotal			$4,908,733.00
100000	Fee (7.5%)	1.000	LS	368,155.00	368,155.00
	Provisional Sums/Allowances				
200000	Drainage Prov. Sum for Low End	1.000	PS	50,000.00	50,000.00
		Bid Total ========>			$5,326,888.00

**Notes:
Items in italics are Non-Additive.


Project Location
7-Eleven
875 E 400 S
Village Inn
Goodly Cookies
Faultline Park
The Queens' Tea
Incline Terrace
Red Rock Pharmacy
Maple Ridge Rehab and Nursing
Anniversary Inn - 5th South
City View Apartments
Hell House
Cleanco Auto Detailing
Blissful Bean
Aztec Home Owners Association
Little Caesars Pizza
Google Earth
400 ft
N

UTA University S-Curve Replacement Rail Materials													
Track Takeoff													
									Spacing (Inches OC)	30	27	24	24
Curve	Track	Start	End	Distance	Point	Radius	Super (IN)	Unit	Comment	DF Fast., Non-PC Over 755 FT Radius (30" OC)	DF Fast., Non-PC 300-755 FT Radius (27" OC)	DF Fast., PC, Under 300 FT Radius (24" OC)	DF Fast., Rest. Rail, Under 300 FT Radius (24" OC)
	WB	76+50.00	77+11.33	61.33	RR Start		0	TF		49			
239	WB	77+11.33	77+24.33	13	TS		0	TF	Restraining Rail 13 FT past end/beginning of curve spiral			7	7
239	WB	77+24.33	78+51.62	127.29	SC	206.75	2.25	TF				64	64
239	WB	78+51.62	80+41.56	189.94	CS	206.75	4.5	TF				95	95
239	WB	80+41.56	81+67.41	125.85	ST	206.75	2.25	TF				63	63
239	WB	81+67.41	81+80.41	13	RR End		0	TF	Restraining Rail 13 FT past end/beginning of curve spiral			7	7
	WB	81+80.41	82+49.15	68.74	TS		0	TF		55			
240	WB	82+49.15	83+72.00	122.85	SC	373.75	1.75	TF			109		
240	WB	83+72.00	84+41.48	69.48	CCS	373.75	3.5	TF			62		
240/241	WB	84+41.48	85+09.38	67.9	CSC	555.75	2.5	TF			60		
241	WB	85+09.38	85+56.92	47.54	CCS	737.75	1.5	TF			42		
241/242	WB	85+56.92	86+10.50	53.58	CSC	552.88	2.5	TF			48		
242	WB	86+10.50	88+73.59	263.09	CS	368	3.5	TF			234		
242	WB	88+73.59	89+73.63	100.04	ST	368	1.75	TF			89		
	WB	89+73.63	91+00.00	126.37			0	TF		101			
	EB	76+50.00	77+28.01	78.01	RR Start		0	TF		62			
137	EB	77+28.01	77+41.01	13	TS		0	TF	Restraining Rail 13 FT past end/beginning of curve spiral			7	7
137	EB	77+41.01	78+79.30	138.29	SC	190	2.25	TF				69	69
137	EB	78+79.30	80+30.04	150.74	CS	190	4.5	TF				75	75
137	EB	80+30.04	81+68.45	138.41	ST	190	2.25	TF				69	69
137	EB	81+68.45	81+81.45	13	RR End		0	TF	Restraining Rail 13 FT past end/beginning of curve spiral			7	7
	EB	81+81.45	82+38.27	56.82	TS		0	TF		45			
138	EB	82+38.27	83+72.65	134.38	SC	389.25	1.75	TF			119		
138	EB	83+72.65	84+42.14	69.49	CCS	389.25	3.5	TF			62		
138/139	EB	84+42.14	85+12.16	70.02	CSC	571.25	2.5	TF			62		
139	EB	85+12.16	85+60.06	47.9	CCS	753.25	1.5	TF			43		
139/140	EB	85+60.06	86+15.34	55.28	CSC	568.38	2.5	TF			49		
140	EB	86+15.34	88+93.66	278.32	CS	383.5	3.5	TF			247		
140	EB	88+93.66	89+98.82	105.16	ST	383.5	1.75	TF			93		
	EB	89+98.82	90+71.15	72.33	PC		0	TF		58			
141	EB	90+71.15	91+00.00	28.85		10000	0	TF		23			
				Average Value						394	1321	462	462
115 RE DF Fasteners (E-Clip or Fastclip)- Including 1/8" HDPE Shim- Entire Project													
Total				**2177**				**EA**	**DF Fasteners- Standard**				
Total				**462**				**EA**	**DF Fasteners- Restraining Rail**				
									*** Concrete Inserts to be Epoxy Coated**				
DF Slab on Grade													
TF		**Width**	**Depth**	**Slab Concrete**									
2900		**8**	**0.75**	**645**				**CY**					
				150				**#/CY**	**Epoxy Coated Rebar Pounds per CY Assumed**				
				96750				**LBS**	**Epoxy Coated Rebar Pounds**				
									Assumed Expansion Joints Every 100 FT OC in Slab with 1 inch Smooth Dowels every 1 FT OC.				
									Assumed Retainer Curb on Edge of Slab to hold Infill Aggregate Base & Lock Infill.				



REV	DATE	Description
		REVISION BLOCK
1	2/28/02	AS–BUILT
0	1/24/01	ISSUED FOR CONSTRUCTION

REGISTERED PROFESSIONAL ENGINEER
ANDREW W. SOKOL
4737292-2202
STATE OF UTAH
EXPIRES: 12/31/2002
NOT VALID UNLESS SIGNED

A Joint Venture of
CH2MHILL
Hatch Mott MacDonald
STV Incorporated
CHS DESIGNERS

UTA TRAX
UNIVERSITY LRT LINE

Designed By: A. SOKOL
Drawn By: H. BARKHORDARIAN
Checked By: R. NIERE
Approved By: G. TAKSALI

KEY MAP

TRACK PLAN AND PROFILE SHEETS

Scale: AS SHOWN
CADD Filename: K–003AB
Submittal Date: FEBRUARY 28, 2002
UTA Contract No.: UT99–05VT–DB WE
Drawing No.: K–003
Sheet No.: 6

RAIL, RESTRAINING RAIL, SHOP CURVED RAIL PREMIUM RAIL

HORIZONTAL ALIGNMENT AND GENERAL ARRANGEMENTS

SEE DRAWING K-006

SHOP CURVED RAIL
TRACK SLAB TIE SPACING
PREMIUM RAIL
67+25 — 67+96 — 5' — 10' — 67+05 — 71+85

77+24 — 81+67 — 5' — 77+02

NORTH RAIL
115 RE
WESTBOUND TRACK
115 RE
SOUTH RAIL
NORTH RAIL
115 RE
EASTBOUND TRACK
115 RE
SOUTH RAIL

81+80
~~77+24~~ 77+11
~~81+67~~ RESTRAINING RAIL (TYP.)

Restraining Rail will now extend 13 FT past point of tangent to match UTA's updated design from UTA Airport Trax Project

~~77+41~~ 77+28 — ~~81+68~~ 81+81

SHOP CURVED RAIL
TRACK SLAB TIE SPACING
PREMIUM RAIL
67+96 — 71+96 — 10' — 77+41 — 81+68 — 5' — 77+20

Project Limits

WESTBOUND

1800 | 40 | 1.25 | 2.31 | 230
SC = 59+93.59
CS = 60+12.23
PRS = 60+94.23
1813.5 | 40 | 1.25 | 2.29 | 231
SC = 61+74.53
CCS = 61+97.07
CSC = 62+46.95
2513.5 | 40 | 0.5 | 2.05 | 232
CS = 63+76.08
800 EAST
℄ PRS = 64+44.08
1836.5 | 30 | 0.5 | 1.47 | 233
SC = 65+19.08
CS = 65+58.69
SST = 66+21.31
393 | 20 | 1.25 | 2.83 | 234
SS = 66+72.49
PRS = 67+25.49
275 | 15 | 0.5 | 2.78 | 235
SS = 67+60.74
ST = 67+96.00
℄ WB-TRACK
24'-6"
1025 | 25 | 0.5 | 1.95 | 236
TS = 71+50.46
SC = 71+80.46
℄ CS = 72+36.03
900 EAST
PRS = 72+66.03
SC 72+98.03
1025 | 25 | 0.5 | 1.95 | 237
CS = 73+59.31
ST = 73+96.32
STA 74+50
PC = 74+93.61
10000 | 40 | 0 | 0.64 | 238
PT = 75+87.48
900 EAST STATION
℄ EB-TRACK
13'-6"
18" THICK TRACK SLAB
16" THICK TRACK SLAB

206.75 | 20 | 4.5 | 3.26 | 239
TS = 77+24.33
SC = 78+51.62
CS = 80+41.56
373.75 | 25 | 3.5 | 3.21 | 240
ST = 81+67.41
TS = 82+49.15
SC = 83+72.00
CCS = 84+41.48
737.75 | 25 | 1.5 | 1.90 | 241
CSC = 85+09.38
CCS = 85+56.92
CSC = 86+10.50
368 | 25 | 3.5 | 3.31 | 242
CS = 88+73.59
ST = 89+73.63
EASTBOUND

400 SOUTH
1000 EAST
16'-9"
15'-9"
15'-6"
15'-6"

SC = 60+14.47
CS = 60+33.87
PRS = 61+15.87
131 | 2.29 | 1.25 | 40 | 1813.5
SC = 61+95.87
CCS = 62+06.85
CSC = 62+79.88
132 | 2.31 | 1.25 | 40 | 1800
CS = 63+94.32
PRS = 64+64.32
133 | 2.07 | 0.5 | 40 | 2500
SC = 65+39.32
CS = 65+70.22
ST = 66+67.27
134 | 2.97 | 0.5 | 40 | 1850
BEGIN STATION PLATFORM
68+18.61 EB =
67+98.33 WB
END STATION PLATFORM
71+73.61 EB =
71+53.33 WB
PC = 72+16.43
PT = 73+16.04
135 | 0.64 | 0 | 40 | 10000

TS = 77+41.01
SC = 78+79.30
137 | 3.94 | 4.5 | 20 | 190
CS = 80+30.04
ST = 81+68.45
TS = 82+38.27
138 | 2.93 | 3.5 | 25 | 389.25
SC = 83+72.65
CCS=84+42.14
139 | 1.83 | 1.5 | 25 | 753.25
CSC = 85+12.16
CCS = 85+60.06
CSC = 86+15.34
140 | 3.04 | 3.5 | 25 | 383.5
CS = 88+93.66

SEE DRAWING K-008

TRACK PROFILE
(EASTBOUND LOW RAIL)

4380 / 4370 / 4360 / 4350 / 4340 / 4330 / 4320

100' V.C.
PVI STA = 61+00
PVI ELEV = 4336.40
2.59%
160.00' VC
PVI STA = 63+00
PVI ELEV = 4341.57
1.39%
140.00' VC
PVI STA = 64+80
PVI ELEV = 4344.07
3.03%
60.00' VC
PVI STA = 67+80
PVI ELEV = 4353.15
2.75%
120.00' VC
PVI STA = 73+00
PVI ELEV = 4367.45
4.40%
240.00' VC
PVI STA = 78+30
PVI ELEV = 4390.75
7.00%
200.00' VC
PVI STA = 82+00
PVI ELEV = 4416.65
6.21%
200.00' VC
PVI STA = 84+50
PVI ELEV = 4432.17
7.00%

4470 / 4460 / 4450 / 4440 / 4430 / 4420 / 4410

60+00 — 70+00 — 80+00 — 90+00

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REV	DATE	Description
		REVISION BLOCK
1	2/28/02	AS-BUILT
0	1/24/01	ISSUED FOR CONSTRUCTION

REGISTERED PROFESSIONAL ENGINEER
ANDREW W. SOKOL
4737292-2202
STATE OF UTAH
EXPIRES: 12/31/2002
NOT VALID UNLESS SIGNED

A Joint Venture of
CH2MHILL
Hatch Mott MacDonald
STV Incorporated
CHS DESIGNERS

UTA TRAX
UNIVERSITY LRT LINE

Designed By: G. MARAVILLA/R. NIERE
Drawn By: G. MARAVILLA
Checked By: A. SOKOL
Approved By: G. TAKSALI

TRACK CHARTS

STA 60+00 TO STA 90+00

Scale: 1"=100'H, 1"=10'V
CADD Filename: K-007AB
Submittal Date: FEBRUARY 28, 2002
UTA Contract No.: UT99-05VT-DB WE
Drawing No.: K-007
Sheet No.: 9

RAIL, RESTRAINING RAIL, SHOP CURVED RAIL PREMIUM RAIL

HORIZONTAL ALIGNMENT AND GENERAL ARRANGEMENTS

SEE DRAWING K-007

SEE DRAWING K-009

SHOP CURVED RAIL
TRACK SLAB TIE SPACING — 10'
PREMIUM RAIL

93+02 94+63 100+63

111+45 114+22 119+40
111+25 5' 10'

NORTH RAIL
115 RE
WESTBOUND TRACK
115 RE
SOUTH RAIL
RESTRAINING RAIL (TYP.)
NORTH RAIL
115 RE
EASTBOUND TRACK
115 RE
SOUTH RAIL

111+45 114+22 119+20
111+80 114+62 119+54

SHOP CURVED RAIL
TRACK SLAB TIE SPACING — 10'
PREMIUM RAIL

93+20 94+80 100+80

111+80 114+55 119+79
111+60 5' 10'

WESTBOUND

Project Limits

1100 EAST

1200 EAST

1300 EAST

EASTBOUND

500 SOUTH

ST = 89+98.82
PC = 90+71.15
PT = 91+83.91
141 | 0.64 | 0 | 40 | 10000

13'-6"

TS = 106+98.94
SC = 107+60.94
CS = 108+19.86
ST = 108+81.86
TS = 109+49.08
5000 | 45 | 0.5 | 1.12 | 243

SC = 110+11.08
CS = 110+71.06
ST = 111+33.06
TS = 111+45.12
5000 | 45 | 0.5 | 1.12 | 244

SC = 112+47.82
CCS = 113+07.73
CSC = 113+51.62
300 | 15 | 0.5 | 2.78 | 245
82 | 9 | 0.5 | 3.46 | 246

PT = 114+22.01
PS No.8 = 114+23.01
PITO No.8 = 114+43.94
PITO No.8 = 115+56.83
PS No.8 = 115+77.76

STADIUM STATION
℄ WB-TRACK
NO. 8 P.O.
D. X-OVER
℄ EB-TRACK
14'-2"
STADIUM STATION

TS = 119+39.72
SC = 119+69.72

TS = 107+17.09
SC = 107+79.09
CS = 108+38.01
ST = 109+00.01
TS = 109+67.23
142 | 1.12 | 0.5 | 45 | 5000

SC=110+29.23
CS=110+89.20
143 | 1.12 | 0.5 | 45 | 5000

ST = 111+51.20
TS = 111+79.81
144 | 2.62 | 0.5 | 15 | 300

SC = 112+70.76
CCS = 113+41.66
CSC = 113+86.54
145 | 3.46 | 0.5 | 9 | 82

PT=114+54.91
PS No.8 = 114+67.64
PITO No.8 = 114+88.57
PITO No.8 = 116+00.13
PS No.8 = 116+21.06

BEGIN STATION PLATFORM
116+39.66 EB =
115+94.76 WB

BEGIN STATION PLATFORM
119+73.66 EB =
119+28.76 WB

TS = 119+78.93

TRACK PROFILE
(EASTBOUND LOW RAIL)

4530 4520 4510 4500 4490 4480 4470

180.00' VC
PVI STA = 92+70
PVI ELEV = 4489.55
4.32%
250.00' VC
PVI STA = 96+00
PVI ELEV = 4503.80
7.00%

200.00' VC
PVI STA = 100+65
PVI ELEV = 4536.35
4.26%
100.00' VC
PVI STA = 105+50
PVI ELEV = 4557.01

100.00' VC
PVI STA = 108+00
PVI ELEV = 4567.48
4.19%
3.17%
100.00' VC
PVI STA = 110+00
PVI ELEV = 4573.82
4.12%
80.00' VC
PVI STA = 112+40
PVI ELEV = 4583.71
5.28%
160.00' VC
PVI STA = 113+80
PVI ELEV = 4591.10
2.10%

4610 4600 4590 4580 4570 4560

90+00 100+00 110+00 120+00

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UNIVERSITY LRT LINE

Designed By: G. MARAVILLA/R. NIERE
Drawn By: G. MARAVILLA
Checked By: A. SOKOL
Approved By: G. TAKSALI

TRACK CHARTS

STA 90+00 TO STA 120+00

Scale: 1"=100'H, 1"=10'V
CADD Filename: K-008AB
Submittal Date: FEBRUARY 28, 2002
UTA Contract No.: UT99-05VT-DB WE
Drawing No.: K-008
Sheet No.: 10

I:\LRT PROJECTS\University LRT Project\U-Line As-Builts October 2002\Track and Stations\K-008AB.dwg, Layout1, 11/28/2005 12:15:18 PM, Carlee Slama

TRACK ALIGNMENT DATA – EASTBOUND TRACK

131
V=40 MPH
E=1.25"
U=2.29"

PI	60+24.18			496761.4048	55984.6082
	LENGTH:	188.02	COURSE:	N 86-32-40 E	
	DELTA:	3-12-13			
	SPIRAL CURVE DATA: CLOTHOID				
TS	59+32.47			496761.0013	55892.8923
SPI				496761.2418	55947.5599
SC	60+14.47			496761.9800	55974.8846
	LENGTH:	82.00	L TAN:	54.67	
	RADIUS:	1813.50	S TAN:	27.33	
	THETA:	1-17-43	P:	0.15	
	X:	82.00	K:	41.00	
	Y:	0.62	A:	385.63	
	CHORD:	82.00	COURSE:	N 89-18-58 E	
	TS:	91.72			
	CIRCULAR CURVE DATA				
SC	60+14.47			496761.9800	55974.8846
RP				498574.8186	55925.9129
CS	60+33.87			496762.6076	55994.2743
	DELTA:	00-36-47	TYPE:	LEFT	
	RADIUS:	1813.50	DOC:	03-09-34	
	LENGTH:	19.40	TANGENT:	9.70	
	MID-ORD:	0.03	EXTERNAL:	0.03	
	CHORD:	19.40	COURSE:	N 88-08-46 E	
	ES:	0.86			
	SPIRAL CURVE DATA: CLOTHOID				
SC	60+33.87			496762.6076	55994.2743
SPI				496763.6380	56021.5896
PRS	61+15.87			496766.9332	56076.1583
	LENGTH:	82.00	L TAN:	54.67	
	RADIUS:	1813.50	S TAN:	27.33	
	THETA:	1-17-43	P:	0.15	
	X:	82.00	K:	41.00	
	Y:	0.62	A:	385.63	
	CHORD:	82.00	COURSE:	N 86-58-34 E	
	TS:	91.72			

132
V=40 MPH
E=1.25"
U=2.31"

PI	62+12.17			496772.7378	56172.2840
	LENGTH:	143.87	COURSE:	S 89-50-01 E	
	DELTA:	3-37-19			
	SPIRAL CURVE DATA: CLOTHOID				
PRS	61+15.87			496766.9332	56076.1583
SPI				496770.1480	56129.3960
SC	61+95.87			496771.1635	56156.0446
	LENGTH:	80.00	L TAN:	53.33	
	RADIUS:	1800.00	S TAN:	26.67	
	THETA:	1-16-24	P:	0.15	
	X:	80.00	K:	40.00	
	Y:	0.59	A:	379.47	
	CHORD:	80.00	COURSE:	N 86-58-07 E	
	TS:	96.30			
	CIRCULAR CURVE DATA				
SC	61+95.87			496771.1635	56156.0446
RP				494972.4692	56224.5914
CCS	62+06.85			496771.5484	56167.0233
	DELTA:	00-20-59	TYPE:	RIGHT	
	RADIUS:	1800.00	DOC:	03-10-59	
	LENGTH:	10.99	TANGENT:	5.49	
	MID-ORD:	0.01	EXTERNAL:	0.01	
	CHORD:	10.99	COURSE:	N 87-59-33 E	
	ES:	1.03			
	COMPOUND SPIRAL CURVE DATA				
CCS	62+06.85			496771.5484	56167.0233
SPI				496772.6529	56201.5410
CSC	62+79.88			496772.5412	56240.0390
	LENGTH:	73.03	L TAN:	38.50	
	RADIUS:	1800.00	S TAN:	34.54	
	THETA:	1-59-57	P:	0.11	
	X:	73.01	K:	10.22	
	Y:	1.20	A:	685.17	
	CHORD:	73.02	COURSE:	N 89-13-16 E	
	TS:	67.76			

133
V=40 MPH
E=0.5"
U=2.07"

PI	63+55.99			496772.3203	56316.1499
	LENGTH:	205.72	COURSE:	S 86-24-31 E	
	DELTA:	3-25-30			
	CIRCULAR CURVE DATA				
CSC	62+79.88			496772.5412	56240.0390
RP				494272.5517	56232.7827
CS	63+94.32			496769.5901	56354.4349
	DELTA:	02-37-22	TYPE:	RIGHT	
	RADIUS:	2500.00	DOC:	02-17-31	
	LENGTH:	114.44	TANGENT:	57.23	
	MID-ORD:	0.65	EXTERNAL:	0.66	
	CHORD:	114.43	COURSE:	S 88-31-20 E	
	ES:	1.16			
	SPIRAL CURVE DATA: CLOTHOID				
CS	63+94.32			496769.5901	56354.4349
SPI				496768.4546	56377.7411
PRS	64+64.32			496765.5315	56424.3166
	LENGTH:	70.00	L TAN:	46.67	
	RADIUS:	2500.00	S TAN:	23.33	
	THETA:	0-48-08	P:	0.08	
	X:	70.00	K:	35.00	
	Y:	0.33	A:	418.33	
	CHORD:	70.00	COURSE:	S 86-40-34 E	
	TS:	108.38			

134
V=40 MPH
E=0.5"
U=2.97"

PI	65+61.66			496759.4343	56521.4637
	LENGTH:	704.62	COURSE:	N 89-58-12 E	
	DELTA:	3-37-16			
	SPIRAL CURVE DATA: CLOTHOID				
PRS	64+64.32			496765.5315	56424.3166
SPI				496762.3994	56474.2195
SC	65+39.32			496761.3395	56499.1980
	LENGTH:	75.00	L TAN:	50.00	
	RADIUS:	1850.00	S TAN:	25.00	
	THETA:	1-09-41	P:	0.13	
	X:	75.00	K:	37.50	
	Y:	0.51	A:	372.49	
	CHORD:	75.00	COURSE:	S 86-47-45 E	
	TS:	97.34			
	CIRCULAR CURVE DATA				
SC	65+39.32			496761.3395	56499.1980
RP				498609.6760	56577.6327
CS	65+70.22			496760.2874	56530.0761
	DELTA:	00-57-25	TYPE:	LEFT	
	RADIUS:	1850.00	DOC:	03-05-49	
	LENGTH:	30.90	TANGENT:	15.45	
	MID-ORD:	0.06	EXTERNAL:	0.06	
	CHORD:	30.90	COURSE:	S 88-02-55 E	
	ES:	1.09			
	SPIRAL CURVE DATA: CLOTHOID				
CS	65+70.22			496760.2874	56530.0761
SPI				496759.4557	56562.4194
ST	66+67.27			496759.4895	56627.1256
	LENGTH:	97.06	L TAN:	64.71	
	RADIUS:	1850.00	S TAN:	32.35	
	THETA:	1-30-11	P:	0.21	
	X:	97.05	K:	48.53	
	Y:	0.85	A:	423.74	
	CHORD:	97.05	COURSE:	S 89-31-44 E	
	TS:	105.66			

135
V=40 MPH
E=0"
U=0.64"

PI	72+66.24			496759.8022	57226.0868
	LENGTH:	728.46	COURSE:	N 89-23-58 E	
	DELTA:	0-34-14			
	CIRCULAR CURVE DATA				
PC	72+16.43			496759.7762	57176.2850
RP				506759.7749	57171.0631
PT	73+16.04			496760.3243	57275.8859
	DELTA:	00-34-14	TYPE:	LEFT	
	RADIUS:	10000.00	DOC:	00-34-23	
	LENGTH:	99.60	TANGENT:	49.80	
	MID-ORD:	0.12	EXTERNAL:	0.12	
	CHORD:	99.60	COURSE:	N 89-41-05 E	
	ES:	0.12			

137
V=20 MPH
E=4.5"
U=3.94"

PI	79+94.69			496767.4381	57954.5042
	LENGTH:	323.55	COURSE:	S 03-25-29 E	
	DELTA:	87-10-33			
	SPIRAL CURVE DATA: CLOTHOID				
TS	77+41.01			496764.7790	57700.8396
SPI				496765.7522	57793.6749
SC	78+79.30			496749.5931	57837.4749
	LENGTH:	138.29	L TAN:	92.84	
	RADIUS:	190.00	S TAN:	46.69	
	THETA:	20-51-04	P:	4.17	
	X:	136.47	K:	68.84	
	Y:	16.62	A:	162.10	
	CHORD:	137.48	COURSE:	S 83-39-29 E	
	TS:	253.68			
	CIRCULAR CURVE DATA				
SC	78+79.30			496749.5931	57837.4749
RP				496571.3372	57771.7115
CS	80+30.04			496649.5049	57944.8872
	DELTA:	45-27-22	TYPE:	RIGHT	
	RADIUS:	190.00	DOC:	30-09-20	
	LENGTH:	150.74	TANGENT:	79.59	
	MID-ORD:	14.75	EXTERNAL:	16.00	
	CHORD:	146.82	COURSE:	S 47-01-17 E	
	ES:	78.08			
	SPIRAL CURVE DATA: CLOTHOID				
SC	80+30.04			496649.5049	57944.8872
SPI				496606.9164	57964.1107
ST	81+68.45			496514.1626	57969.6617
	LENGTH:	138.41	L TAN:	92.92	
	RADIUS:	190.00	S TAN:	46.73	
	THETA:	20-52-07	P:	4.18	
	X:	136.58	K:	68.90	
	Y:	16.65	A:	162.16	
	CHORD:	137.59	COURSE:	S 10-22-23 E	
	TS:	253.73			

REV	DATE	Description
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UNIVERSITY LRT LINE

Designed By: A. SOKOL
Drawn By: H. BARKHORDARIAN
Checked By: R. NIERE
Approved By: G. TAKSALI

TRACK ALIGNMENT DATA
EASTBOUND TRACK

Scale: NTS
CADD Filename: K-015AB
Submittal Date: FEBRUARY 28, 2002
UTA Contract No.: UT99-05VT-DB WE
Drawing No.: K-015
Sheet No.: 17

TRACK ALIGNMENT DATA – EASTBOUND TRACK

138
V=25 MPH
E=3.5"
U=2.93"

PI	83+99.95			496283.0766	57983.4912
	LENGTH:	140.58	COURSE:	S 31-21-37 E	
	DELTA:	27-56-08			
	SPIRAL CURVE DATA: CLOTHOID				
TS	82+38.27			496444.4664	57973.8327
SPI				496354.9012	57979.1928
SC	83+72.65			496311.1886	57989.5379
	LENGTH:	134.38	L TAN:	89.73	
	RADIUS:	389.25	S TAN:	44.92	
	THETA:	9-53-24	P:	1.93	
	X:	133.98	K:	67.12	
	Y:	7.72	A:	228.71	
	CHORD:	134.20	COURSE:	S 06-43-14 E	
	TS:	161.68			
	CIRCULAR CURVE DATA				
SC	83+72.65			496311.1886	57989.5379
RP				496400.8328	58368.3247
CCS	84+42.14			496245.3468	58011.4779
	DELTA:	10-13-45	TYPE:	LEFT	
	RADIUS:	389.25	DOC:	14-43-10	
	LENGTH:	69.49	TANGENT:	34.84	
	MID-ORD:	1.55	EXTERNAL:	1.56	
	CHORD:	69.40	COURSE:	S 18-25-45 E	
	ES:	13.20			
	COMPOUND SPIRAL CURVE DATA				
CCS	84+42.14			496245.3468	58011.4779
SPI				496216.6114	58023.9986
CSC	85+12.16			496183.4940	58044.1820
	LENGTH:	70.02	L TAN:	38.78	
	RADIUS:	389.25	S TAN:	31.34	
	THETA:	7-48-59	P:	0.65	
	X:	69.84	K:	16.90	
	Y:	4.26	A:	237.49	
	CHORD:	69.97	COURSE:	S 27-52-02 E	
	TS:	116.62			

139
V=25 MPH
E=1.5"
U=1.83"

PI	85+36.12			496163.0339	58056.6515
	LENGTH:	241.18	COURSE:	S 35-00-15 E	
	DELTA:	3-38-38			
	CIRCULAR CURVE DATA				
CSC	85+12.16			496183.4940	58044.1820
RP				496575.4989	58687.3910
CCS	85+60.06			496143.4076	58070.3961
	DELTA:	03-38-38	TYPE:	LEFT	
	RADIUS:	753.25	DOC:	07-36-23	
	LENGTH:	47.90	TANGENT:	23.96	
	MID-ORD:	0.38	EXTERNAL:	0.38	
	CHORD:	47.90	COURSE:	S 33-10-56 E	
	ES:	0.38			

140
V=25 MPH
E=3.5"
U=3.04"

PI	87+77.28			495965.4811	58195.0008
	LENGTH:	254.71	COURSE:	N 89-19-38 E	
	DELTA:	55-40-07			
	COMPOUND SPIRAL CURVE DATA				
CCS	85+60.06			496143.4076	58070.3961
SPI				496118.2936	58087.9838
CSC	86+15.34			496099.7445	58104.2424
	LENGTH:	55.27	L TAN:	30.66	
	RADIUS:	383.50	S TAN:	24.67	
	THETA:	6-13-52	P:	0.41	
	X:	55.18	K:	13.56	
	Y:	2.68	A:	207.80	
	CHORD:	55.25	COURSE:	S 37-46-55 E	
	TS:	217.22			
	CIRCULAR CURVE DATA				
CSC	86+15.34			496099.7445	58104.2424
RP				496352.5294	58392.6381
CS	88+93.66			495972.0385	58344.6913
	DELTA:	41-34-57	TYPE:	LEFT	
	RADIUS:	383.50	DOC:	14-56-25	
	LENGTH:	278.33	TANGENT:	145.61	
	MID-ORD:	24.97	EXTERNAL:	26.71	
	CHORD:	272.26	COURSE:	S 62-01-36 E	
	ES:	51.09			
	SPIRAL CURVE DATA: CLOTHOID				
CS	88+93.66			495972.0385	58344.6913
SPI				495967.6484	58379.5297
ST	89+98.82			495968.4725	58449.6961
	LENGTH:	105.15	L TAN:	70.17	
	RADIUS:	383.50	S TAN:	35.11	
	THETA:	7-51-18	P:	1.20	
	X:	104.96	K:	52.54	
	Y:	4.80	A:	200.81	
	CHORD:	105.07	COURSE:	S 88-03-18 E	
	TS:	254.71			

141
V=40 MPH
E=0"
U=0.64"

PI	91+27.53			495969.9841	58578.4011
	LENGTH:	1681.02	COURSE:	N 89-58-23 E	
	DELTA:	0-38-46			
	CIRCULAR CURVE DATA				
PC	90+71.15			495969.3220	58522.0291
RP				485970.0117	58639.4700
PT	91+83.91			495970.0106	58634.7769
	DELTA:	00-38-46	TYPE:	RIGHT	
	RADIUS:	10000.00	DOC:	00-34-23	
	LENGTH:	112.75	TANGENT:	56.38	
	MID-ORD:	0.16	EXTERNAL:	0.16	
	CHORD:	112.75	COURSE:	N 89-39-00 E	
	ES:	0.16			

142
V=45 MPH
E=0.5"
U=1.12"

PI	108+08.55			495970.7730	60259.4222
	LENGTH:	250.67	COURSE:	S 88-38-29 E	
	DELTA:	1-23-08			
	SPIRAL CURVE DATA: CLOTHOID				
TS	107+17.09			495970.7301	60167.9593
SPI				495970.7495	60209.2927
SC	107+79.09			495970.6311	60229.9591
	LENGTH:	62.00	L TAN:	41.33	
	RADIUS:	5000.00	S TAN:	20.67	
	THETA:	0-21-19	P:	0.03	
	X:	62.00	K:	31.00	
	Y:	0.13	A:	556.78	
	CHORD:	62.00	COURSE:	S 89-54-31 E	
	TS:	91.46			
	CIRCULAR CURVE DATA				
SC	107+79.09			495970.6311	60229.9591
RP				490970.7132	60201.3058
CS	108+38.01			495969.9463	60288.8741
	DELTA:	00-40-31	TYPE:	RIGHT	
	RADIUS:	5000.00	DOC:	01-08-45	
	LENGTH:	58.92	TANGENT:	29.46	
	MID-ORD:	0.09	EXTERNAL:	0.09	
	CHORD:	58.92	COURSE:	S 89-20-03 E	
	ES:	0.40			
	SPIRAL CURVE DATA: CLOTHOID				
CS	108+38.01			495969.9463	60288.8741
SPI				495969.5843	60309.5377
ST	109+00.01			495968.6042	60350.8595
	LENGTH:	62.00	L TAN:	41.33	
	RADIUS:	5000.00	S TAN:	20.67	
	THETA:	0-21-19	P:	0.03	
	X:	62.00	K:	31.00	
	Y:	0.13	A:	556.78	
	CHORD:	62.00	COURSE:	S 88-45-35 E	
	TS:	91.46			

143
V=45 MPH
E=0.5"
U=1.12"

PI	110+59.22			495964.8290	60510.0255
	LENGTH:	120.60	COURSE:	N 89-57-40 E	
	DELTA:	1-23-52			
	SPIRAL CURVE DATA: CLOTHOID				
TS	109+67.23			495967.0103	60418.0609
SPI				495966.0302	60459.3827
SC	110+29.23			495965.6682	60480.0462
	LENGTH:	62.00	L TAN:	41.33	
	RADIUS:	5000.00	S TAN:	20.67	
	THETA:	0-21-19	P:	0.03	
	X:	62.00	K:	31.00	
	Y:	0.13	A:	556.78	
	CHORD:	62.00	COURSE:	S 88-45-35 E	
	TS:	91.99			
	CIRCULAR CURVE DATA				
SC	110+29.23			495965.6682	60480.0462
RP				500964.9013	60567.6145
CS	110+89.20			495964.9775	60540.0161
	DELTA:	00-41-14	TYPE:	LEFT	
	RADIUS:	5000.00	DOC:	01-08-45	
	LENGTH:	59.97	TANGENT:	29.99	
	MID-ORD:	0.09	EXTERNAL:	0.09	
	CHORD:	59.97	COURSE:	S 89-20-24 E	
	ES:	0.40			
	SPIRAL CURVE DATA: CLOTHOID				
CS	110+89.20			495964.9775	60540.0161
SPI				495964.8634	60560.6826
ST	111+51.20			495964.8915	60602.0160
	LENGTH:	62.00	L TAN:	41.33	
	RADIUS:	5000.00	S TAN:	20.67	
	THETA:	0-21-19	P:	0.03	
	X:	62.00	K:	31.00	
	Y:	0.13	A:	556.78	
	CHORD:	62.00	COURSE:	S 89-55-14 E	
	TS:	91.99			

REV	DATE	Description
		REVISION BLOCK
1	2/28/02	AS-BUILT
0	1/24/01	ISSUED FOR CONSTRUCTION

REGISTERED PROFESSIONAL ENGINEER
ANDREW W. SOKOL
4737292-2202
STATE OF UTAH
EXPIRES: 12/31/2002
NOT VALID UNLESS SIGNED

A Joint Venture of
CH2MHILL
Hatch Mott MacDonald
STV Incorporated
CHS DESIGNERS

UTA TRAX
UNIVERSITY LRT LINE

Designed By: A. SOKOL
Drawn By: H. BARKHORDARIAN
Checked By: R. NIERE
Approved By: G. TAKSALI

TRACK ALIGNMENT DATA

EASTBOUND TRACK

Scale: NTS
CADD Filename: K-016AB
Submittal Date: FEBRUARY 28, 2002
UTA Contract No.: UT99-05VT-DB WE
Drawing No.: K-016
Sheet No.: 18

TRACK ALIGNMENT DATA – WESTBOUND TRACK

	PI	79+89.49		496785.3075	57969.2129
		LENGTH:	264.52	COURSE:	S 03-25-29 E
		DELTA:	87-42-49		
		SPIRAL CURVE DATA: CLOTHOID			
	TS	77+24.33		496780.0393	57704.1103
	SPI			496781.7337	57789.3742
	SC	78+51.62		496769.5749	57830.4260
		LENGTH:	127.28	L TAN:	85.28
		RADIUS:	206.75	S TAN:	42.81
		THETA:	17-38-12	P:	3.25
		X:	126.08	K:	63.44
		Y:	12.97	A:	162.22
		CHORD:	126.75	COURSE:	S 85-15-51 E
		TS:	265.15		
239		CIRCULAR CURVE DATA			
V=20 MPH	SC	78+51.62		496769.5749	57830.4260
E=4.5"	RP			496571.3372	57771.7115
U=3.26"	CS	80+41.56		496644.9650	57964.9070
		DELTA:	52-38-22	TYPE:	RIGHT
		RADIUS:	206.75	DOC:	27-42-45
		LENGTH:	189.95	TANGENT:	102.27
		MID-ORD:	21.43	EXTERNAL:	23.91
		CHORD:	183.34	COURSE:	S 47-10-55 E
		ES:	84.44		
		SPIRAL CURVE DATA: CLOTHOID			
	CS	80+41.56		496644.9650	57964.9070
	SPI			496605.4181	57979.9786
	ST	81+67.41		496521.2623	57985.0149
		LENGTH:	125.84	L TAN:	84.31
		RADIUS:	206.75	S TAN:	42.32
		THETA:	17-26-14	P:	3.18
		X:	124.68	K:	62.73
		Y:	12.68	A:	161.30
		CHORD:	125.33	COURSE:	S 09-13-58 E
		TS:	264.52		

	PI	84+01.58		496287.5050	57999.0044
		LENGTH:	135.76	COURSE:	S 31-20-02 E
		DELTA:	27-54-33		
		SPIRAL CURVE DATA: CLOTHOID			
	TS	82+49.15		496439.6646	57989.8982
	SPI			496357.7955	57994.7978
	SC	83+72.00		496317.7670	58003.9223
		LENGTH:	122.85	L TAN:	82.02
		RADIUS:	373.75	S TAN:	41.06
		THETA:	9-24-59	P:	1.68
		X:	122.52	K:	61.37
		Y:	6.72	A:	214.28
		CHORD:	122.70	COURSE:	S 06-33-46 E
		TS:	152.43		
240		CIRCULAR CURVE DATA			
V=25 MPH	SC	83+72.00		496317.7670	58003.9223
E=3.5"	RP			496400.8328	58368.3247
U=3.21"	CCS	84+41.48		496251.8457	58025.5538
		DELTA:	10-39-04	TYPE:	LEFT
		RADIUS:	373.75	DOC:	15-19-48
		LENGTH:	69.48	TANGENT:	34.84
		MID-ORD:	1.61	EXTERNAL:	1.62
		CHORD:	69.38	COURSE:	S 18-10-01 E
		ES:	12.57		
		COMPOUND SPIRAL CURVE DATA			
	CCS	84+41.48		496251.8457	58025.5538
	SPI			496224.0605	58037.6308
	CSC	85+09.38		496191.8496	58057.2415
		LENGTH:	67.90	L TAN:	37.71
		RADIUS:	373.75	S TAN:	30.30
		THETA:	7-50-30	P:	0.64
		X:	67.72	K:	16.73
		Y:	4.13	A:	226.80
		CHORD:	67.85	COURSE:	S 27-50-29 E
		TS:	111.99		

	PI	85+33.16		496171.5424	58069.6050
		LENGTH:	229.86	COURSE:	S 35-01-32 E
		DELTA:	3-41-30		
241		CIRCULAR CURVE DATA			
V=25 MPH	CSC	85+09.38		496191.8496	58057.2415
E=1.5"	RP			496575.4989	58687.3910
U=1.90"	CCS	85+56.92		496152.0732	58083.2504
		DELTA:	03-41-30	TYPE:	LEFT
		RADIUS:	737.75	DOC:	07-45-59
		LENGTH:	47.53	TANGENT:	23.77
		MID-ORD:	0.38	EXTERNAL:	0.38
		CHORD:	47.53	COURSE:	S 33-10-47 E
		ES:	0.38		

	PI	87+63.01		495983.3072	58201.5339
		LENGTH:	2058.05	COURSE:	N 89-58-23 E
		DELTA:	55-00-05		
		COMPOUND SPIRAL CURVE DATA			
	CCS	85+56.92		496152.0732	58083.2504
	SPI			496127.6660	58100.3568
	CSC	86+10.50		496109.7563	58116.0785
		LENGTH:	53.58	L TAN:	29.81
		RADIUS:	368.00	S TAN:	23.83
		THETA:	6-15-08	P:	0.41
		X:	53.49	K:	13.42
		Y:	2.60	A:	198.35
		CHORD:	53.56	COURSE:	S 37-48-11 E
		TS:	206.09		
242		CIRCULAR CURVE DATA			
V=25 MPH	CSC	86+10.50		496109.7563	58116.0785
E=3.5"	RP			496352.5294	58392.6381
U=3.31"	CS	88+73.59		495987.9004	58342.9424
		DELTA:	40-57-40	TYPE:	LEFT
		RADIUS:	368.00	DOC:	15-34-10
		LENGTH:	263.09	TANGENT:	137.45
		MID-ORD:	23.26	EXTERNAL:	24.83
		CHORD:	257.52	COURSE:	S 61-45-30 E
		ES:	47.75		
		SPIRAL CURVE DATA: CLOTHOID			
	CS	88+73.59		495987.9004	58342.9424
	SPI			495983.3891	58376.0423
	ST	89+73.63		495983.4205	58442.8013
		LENGTH:	100.04	L TAN:	66.76
		RADIUS:	368.00	S TAN:	33.41
		THETA:	7-47-17	P:	1.13
		X:	99.86	K:	49.99
		Y:	4.53	A:	191.87
		CHORD:	99.96	COURSE:	S 87-25-53 E
		TS:	241.27		

	PI	107+90.41		495984.2731	60259.5792
		LENGTH:	250.67	COURSE:	S 88-38-29 E
		DELTA:	1-23-08		
		SPIRAL CURVE DATA: CLOTHOID			
	TS	106+98.94		495984.2302	60168.1162
	SPI			495984.2496	60209.4496
	SC	107+60.94		495984.1311	60230.1160
		LENGTH:	62.00	L TAN:	41.33
		RADIUS:	5000.00	S TAN:	20.67
		THETA:	0-21-19	P:	0.03
		X:	62.00	K:	31.00
		Y:	0.13	A:	556.78
		CHORD:	62.00	COURSE:	S 89-54-31 E
		TS:	91.46		
243		CIRCULAR CURVE DATA			
V=45 MPH	SC	107+60.94		495984.1311	60230.1160
E=0.5"	RP			490984.2132	60201.4627
U=1.12"	CS	108+19.86		495983.4464	60289.0310
		DELTA:	00-40-31	TYPE:	RIGHT
		RADIUS:	5000.00	DOC:	01-08-45
		LENGTH:	58.92	TANGENT:	29.46
		MID-ORD:	0.09	EXTERNAL:	0.09
		CHORD:	58.92	COURSE:	S 89-20-03 E
		ES:	0.40		
		SPIRAL CURVE DATA: CLOTHOID			
	CS	108+19.86		495983.4464	60289.0310
	SPI			495983.0844	60309.6946
	ST	108+81.86		495982.1043	60351.0164
		LENGTH:	62.00	L TAN:	41.33
		RADIUS:	5000.00	S TAN:	20.67
		THETA:	0-21-19	P:	0.03
		X:	62.00	K:	31.00
		Y:	0.13	A:	556.78
		CHORD:	62.00	COURSE:	S 88-45-35 E
		TS:	91.46		

	PI	110+41.07		495978.3291	60510.1817
		LENGTH:	104.05	COURSE:	N 89-57-40 E
		DELTA:	1-23-52		
		SPIRAL CURVE DATA: CLOTHOID			
	TS	109+49.08		495980.5104	60418.2166
	SPI			495979.5303	60459.5384
	SC	110+11.08		495979.1683	60480.2019
		LENGTH:	62.00	L TAN:	41.33
		RADIUS:	5000.00	S TAN:	20.67
		THETA:	0-21-19	P:	0.03
		X:	62.00	K:	31.00
		Y:	0.13	A:	556.78
		CHORD:	62.00	COURSE:	S 88-45-35 E
		TS:	91.99		
244		CIRCULAR CURVE DATA			
V=45 MPH	SC	110+11.08		495979.1683	60480.2019
E=0.5"	RP			500978.4014	60567.7702
U=1.12"	CS	110+71.06		495978.4776	60540.1728
		DELTA:	00-41-14	TYPE:	LEFT
		RADIUS:	5000.00	DOC:	01-08-45
		LENGTH:	59.98	TANGENT:	29.99
		MID-ORD:	0.09	EXTERNAL:	0.09
		CHORD:	59.97	COURSE:	S 89-20-24 E
		ES:	0.40		
		SPIRAL CURVE DATA: CLOTHOID			
	CS	110+71.06		495978.4776	60540.1728
	SPI			495978.3635	60560.8392
	ST	111+33.06		495978.3917	60602.1726
		LENGTH:	62.00	L TAN:	41.33
		RADIUS:	5000.00	S TAN:	20.67
		THETA:	0-21-19	P:	0.03
		X:	62.00	K:	31.00
		Y:	0.13	A:	556.78
		CHORD:	62.00	COURSE:	S 89-55-14 E
		TS:	91.99		

REV	DATE	Description
		REVISION BLOCK
2		
1	2/28/02	AS-BUILT
0	1/24/01	ISSUED FOR CONSTRUCTION

REGISTERED PROFESSIONAL ENGINEER
ANDREW W. SOKOL
4737292-2202
STATE OF UTAH
EXPIRES: 12/31/2002
NOT VALID UNLESS SIGNED

A Joint Venture of
CH2MHILL
Hatch Mott MacDonald
STV Incorporated
CHS DESIGNERS

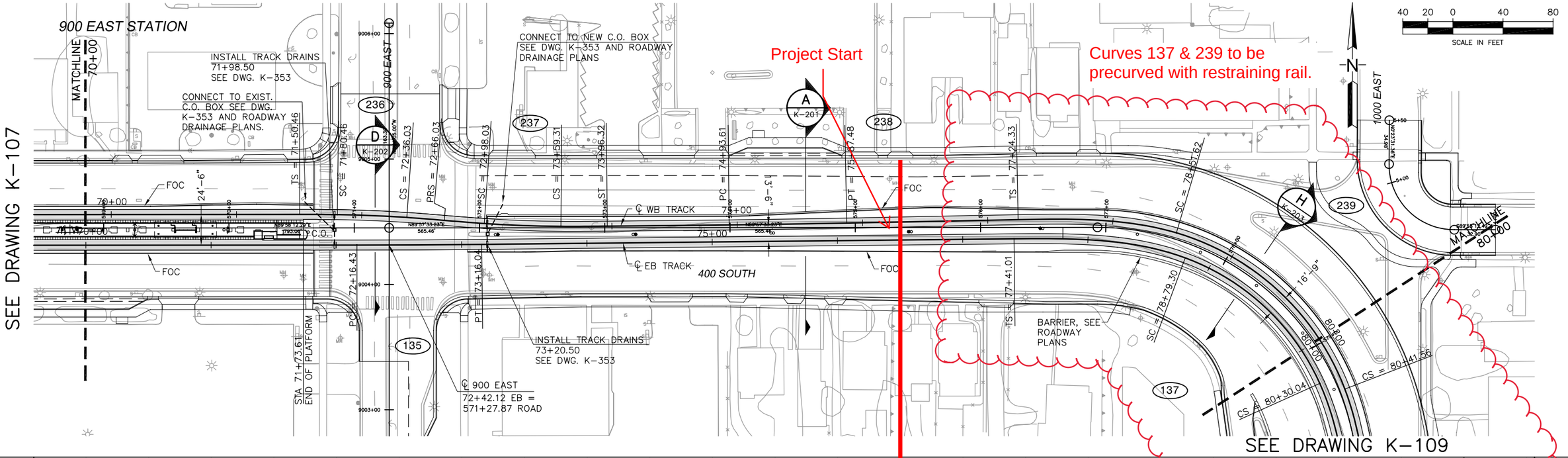
UTA TRAX
UNIVERSITY LRT LINE

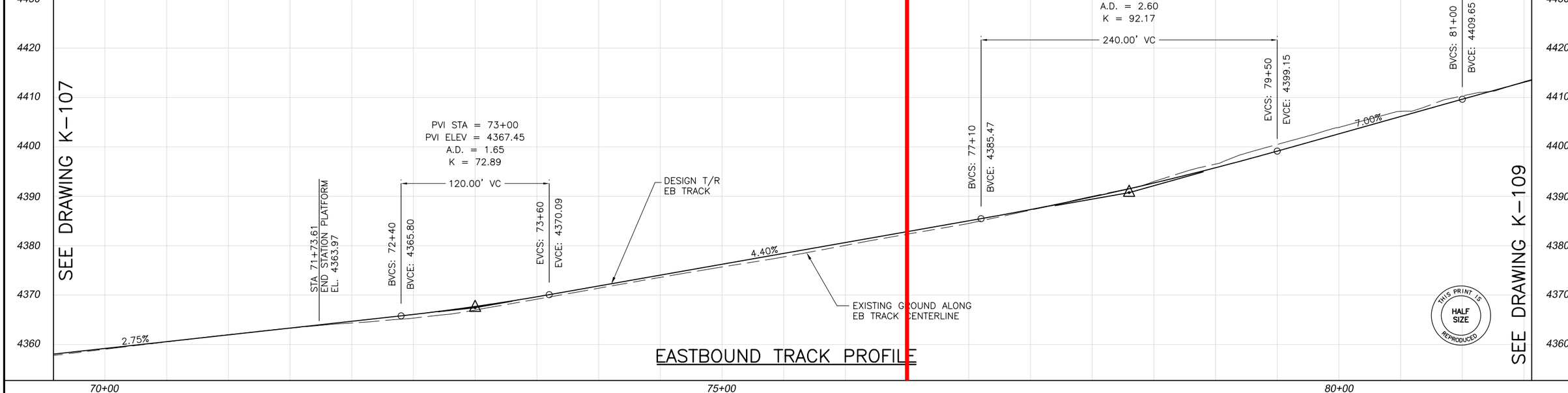
Designed By: A. SOKOL
Drawn By: H. BARKHORDARIAN
Checked By: R. NIERE
Approved By: G. TAKSALI

TRACK ALIGNMENT DATA

WESTBOUND TRACK

Scale: NTS
CADD Filename: K-026AB
Submittal Date: FEBRUARY 28, 2002
UTA Contract No.: UT99-05VT-DB WE
Drawing No.: K-026
Sheet No.: 26





REV	DATE	Description
		REVISION BLOCK
1	2/28/02	AS-BUILT
0	1/24/01	ISSUED FOR CONSTRUCTION

REGISTERED PROFESSIONAL ENGINEER
ANDREW W. SOKOL
4737292-2202
STATE OF UTAH
EXPIRES: 12/31/2002
NOT VALID UNLESS SIGNED

A Joint Venture of CH2MHILL, Hatch Mott MacDonald, STV Incorporated
CHS DESIGNERS

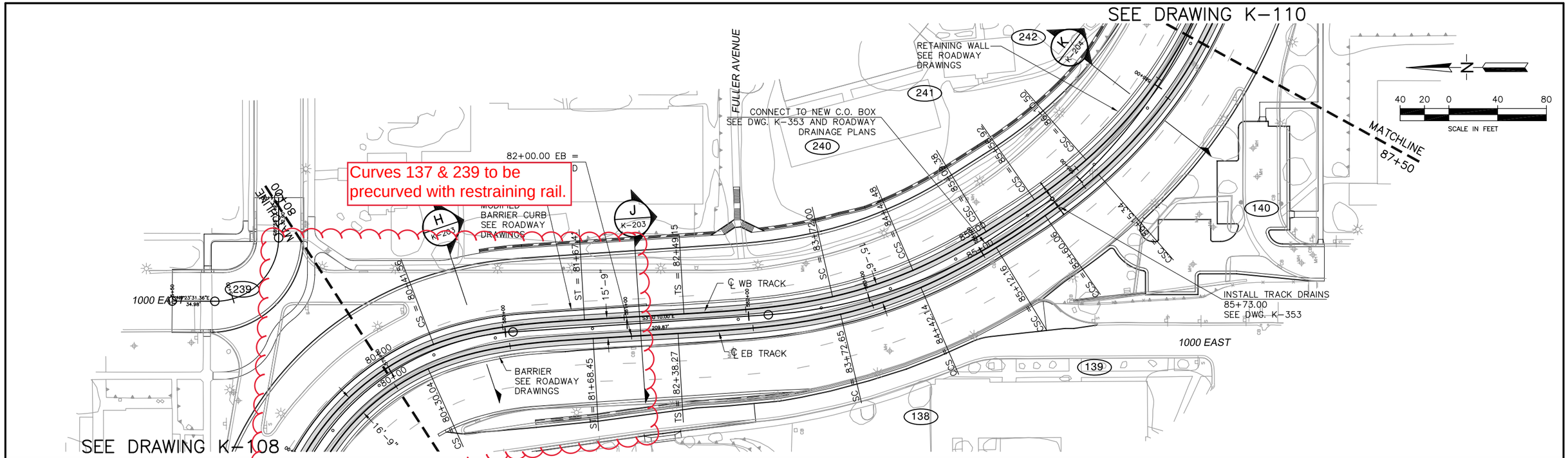
UTA TRAX
UNIVERSITY LRT LINE

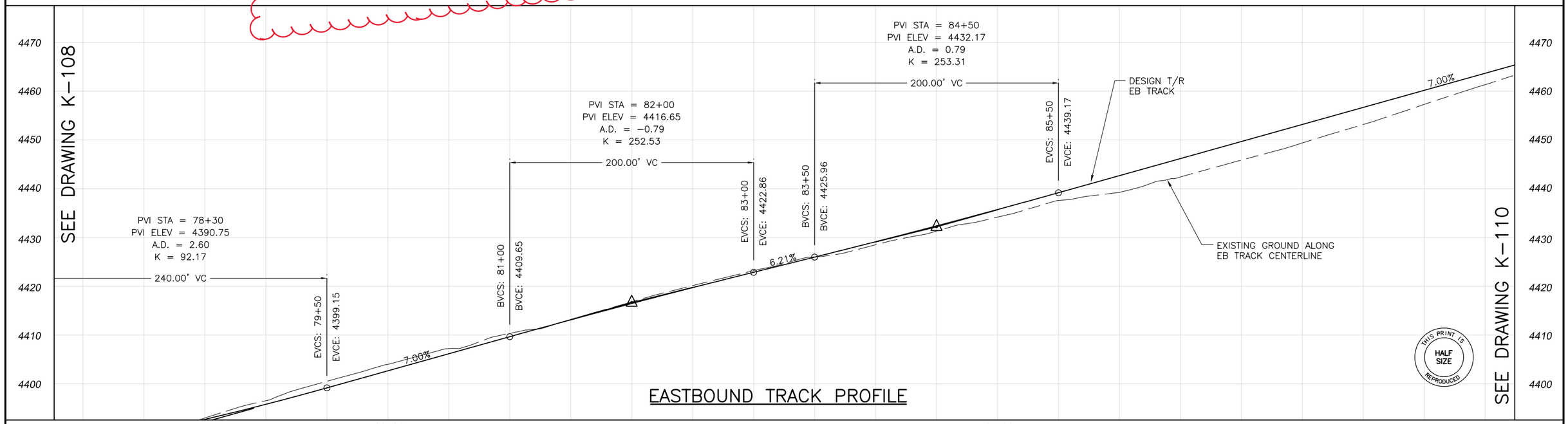
Designed By: A. SOKOL
Drawn By: H. BARKHORDARIAN
Checked By: R. NIERE
Approved By: G. TAKSALI

TRACK PLAN AND PROFILE

STA 70+00 TO 80+00

Scale: 1"=40'H, 1"=10'V
CADD Filename: K-108AB
Submittal Date: FEBRUARY 28, 2002
UTA Contract No.: UT99-05VT-DB WE
Drawing No.: K-108
Sheet No.: 38





EASTBOUND TRACK PROFILE

THIS PRINT IS HALF SIZE REPRODUCED

REV	DATE	Description
2		
1	2/28/02	AS–BUILT
0	1/24/01	ISSUED FOR CONSTRUCTION

REGISTERED PROFESSIONAL ENGINEER — ANDREW W. SOKOL 4737292-2202 — STATE OF UTAH
EXPIRES: 12/31/2002
NOT VALID UNLESS SIGNED

A Joint Venture of CH2MHILL, Hatch Mott MacDonald, STV Incorporated
CHS DESIGNERS

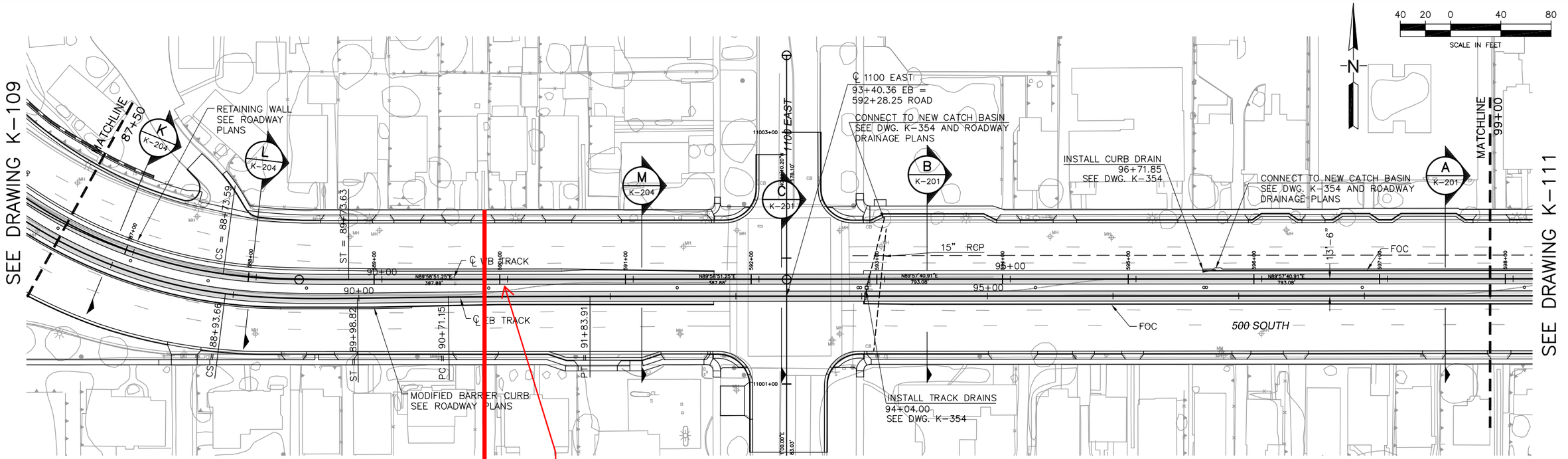
UTA TRAX
UNIVERSITY LRT LINE

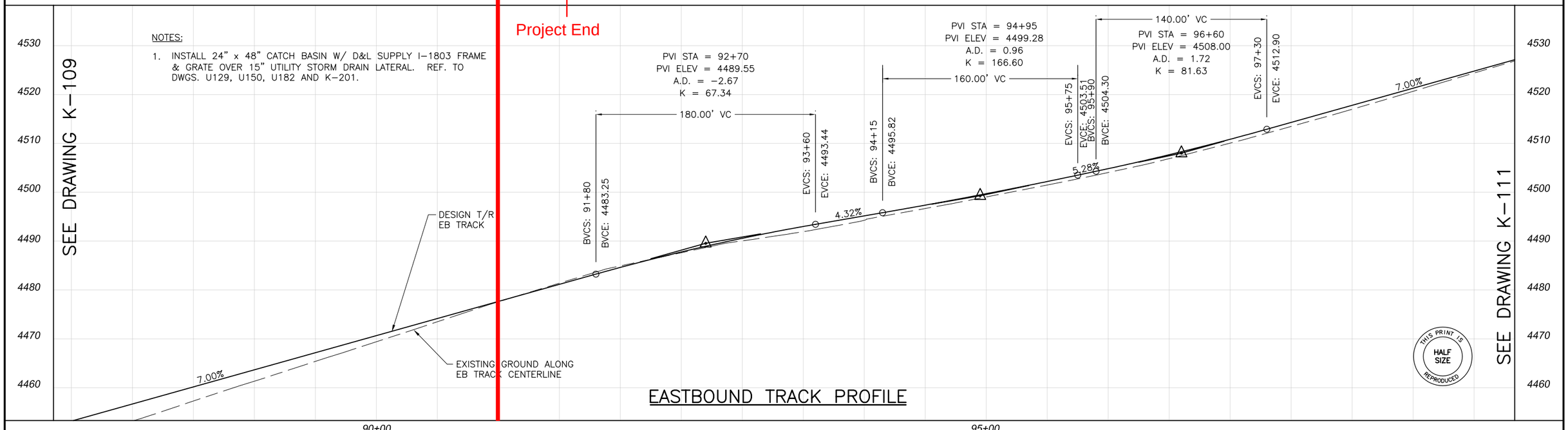
Designed By: A. SOKOL
Drawn By: H. BARKHORDARIAN
Checked By: R. NIERE
Approved By: G. TAKSALI

TRACK PLAN AND PROFILE

STA 80+00 TO STA 87+50

Scale: 1"=40'H, 1"=10'V
CADD Filename: K–109AB
Submittal Date: FEBRUARY 28, 2002
UTA Contract No.: UT99–05VT–DB WE
Drawing No.: K–109
Sheet No.: 39





NOTES:

1. INSTALL 24" x 48" CATCH BASIN W/ D&L SUPPLY I-1803 FRAME & GRATE OVER 15" UTILITY STORM DRAIN LATERAL. REF. TO DWGS. U129, U150, U182 AND K-201.

EASTBOUND TRACK PROFILE

REV	DATE	Description
3	2/28/02	AS-BUILT
2	5/30/01	ADDED CATCH BASIN AT 1100 EAST, REVISED TRACK PROFILE EAST OF 1100 E.
1	5/18/01	REVISED TRACK PROFILE EAST OF 1100 EAST
0	1/24/01	ISSUED FOR CONSTRUCTION

REVISION BLOCK

REGISTERED PROFESSIONAL ENGINEER
ANDREW W. SOKOL
4737292-2202
STATE OF UTAH
EXPIRES: 12/31/2002
NOT VALID UNLESS SIGNED

A Joint Venture of
CH2MHILL
Hatch Mott MacDonald
STV Incorporated
CHS DESIGNERS

UTA TRAX
UNIVERSITY LRT LINE

Designed By: A. SOKOL
Drawn By: H. BARKHORDARIAN
Checked By: R. NIERE
Approved By: G. TAKSALI

TRACK PLAN AND PROFILE

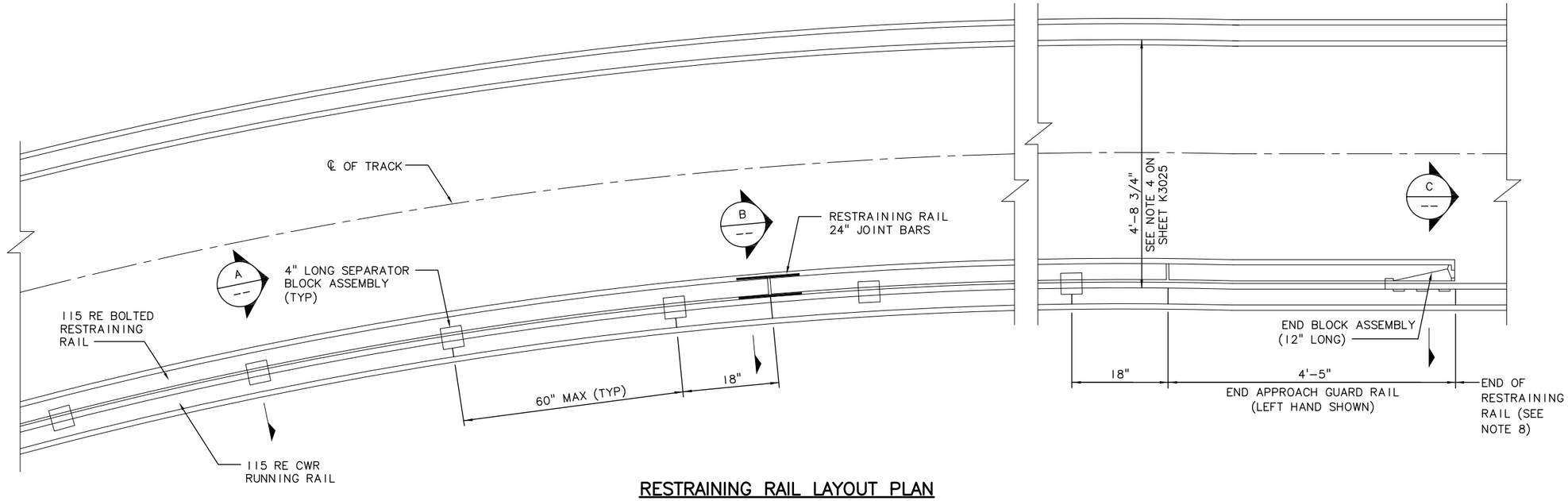
STA 87+50 TO STA 99+00

Scale: 1"=40'H, 1"=10'V
CADD Filename: K-110AB
Submittal Date: FEBRUARY 28, 2002
UTA Contract No.: UT99-05VT-DB WE
Drawing No.: K-110
Sheet No.: 40

THIS PRINT IS HALF SIZE REPRODUCED

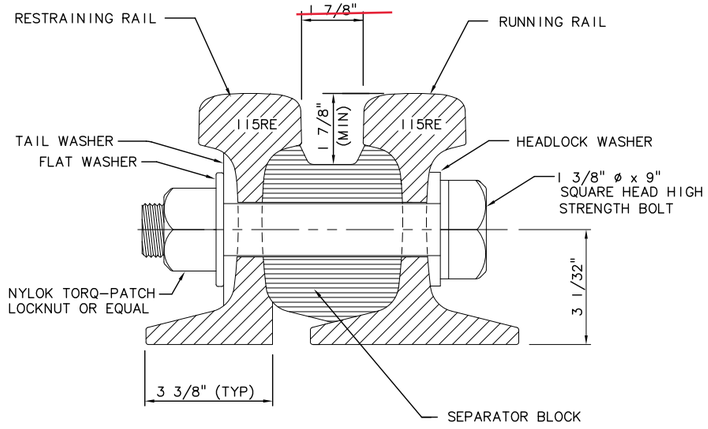
NOTES:

1. SEPARATOR BLOCKS ARE 4" LONG, @ 60" MAXIMUM SPACING O.C.
2. RESTRAINING RAIL JOINT BARS ARE 24" LONG, 4 HOLES.
3. RESTRAINING RAIL DRILLING IS 3 1/2" FROM END OF RAIL 1 7/16" ø, AT 3 1/32" A.B.R.
4. RESTRAINING RAIL IS PRE-DRILLED FOR INSTALLATION OF SEPARATOR BLOCKS. CONTRACTOR SHALL FIELD DRILL RUNNING RAIL TO MATCH HOLES IN RESTRAINING RAIL.
5. SEE SHEET K3025 FOR RESTRAINING RAIL TYPICAL PRE-CURVING DETAIL.
6. SEE TRACK CHARTS FOR LIMITS OF RESTRAINING RAIL.



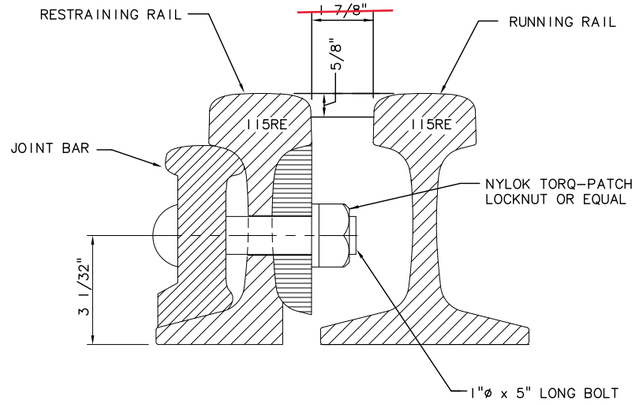
RESTRAINING RAIL LAYOUT PLAN

2" Per RFI 271



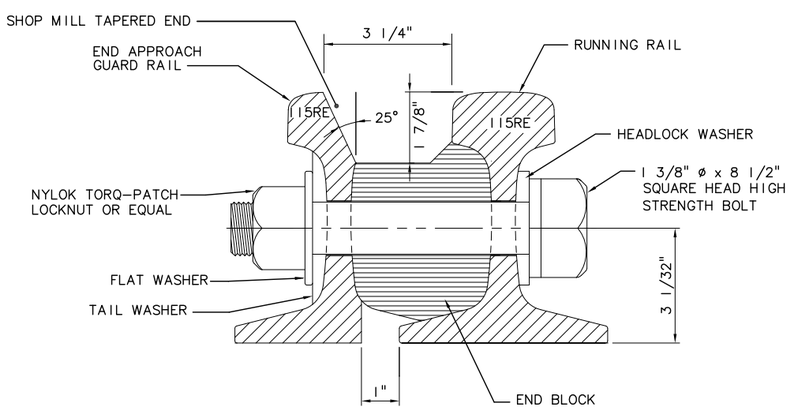
SEPARATOR BLOCK ASSEMBLY

SECTION A / --



RESTRAINING RAIL JOINT ASSEMBLY

SECTION B / --



END BLOCK

SECTION C / --

REV	DATE	DESCRIPTION

STATE OF UTAH — Conformed Set 8-13-2010 — PROFESSIONAL ENGINEER

WilburSmith ASSOCIATES; DAVID EVANS AND ASSOCIATES INC.; Steve Greene & Associates, PLLC; Hatch Mott MacDonald

UTA UTAH TRANSIT AUTHORITY

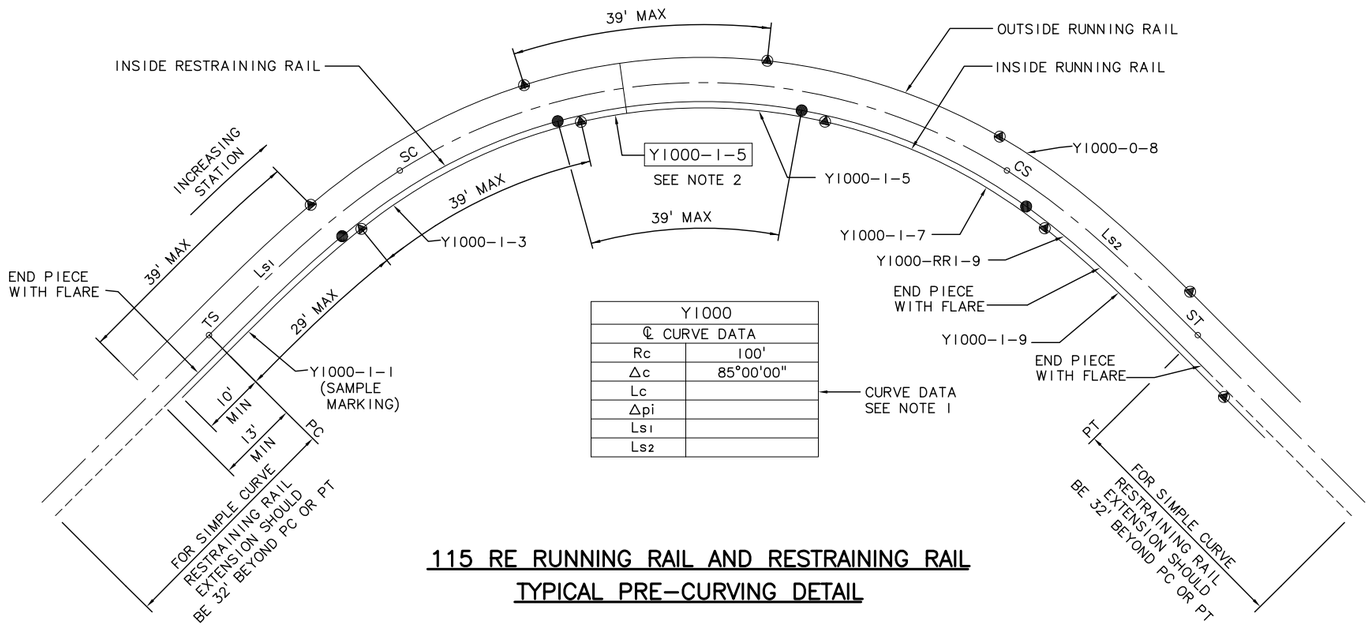
Approved By: _____

Designed By:	J. BLAKE
Drawn By:	R. KOECHLEY
Checked By:	J. BLAKE
Approved By:	S. GREENE

AIRPORT LIGHT RAIL TRANSIT PROJECT

TRACKWORK STANDARDS
RESTRAINING RAIL DETAILS
SHEET 1 OF 2

Scale:	NTS
CADD Filename:	APAK3024.DWG
Submittal Date:	JUNE 25, 2010
UTA Contract No.:	UT08-002VT
Drawing No.:	K3024
Sheet	137 ~~50~~



Y1000	
℄ CURVE DATA	
Rc	100'
Δc	85°00'00"
Lc	
Δpi	
Ls1	
Ls2	

CURVE DATA SEE NOTE 1

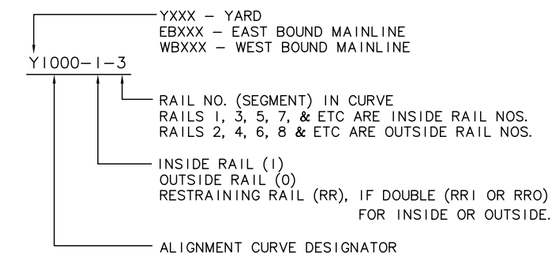
115 RE RUNNING RAIL AND RESTRAINING RAIL TYPICAL PRE-CURVING DETAIL

LEGEND:

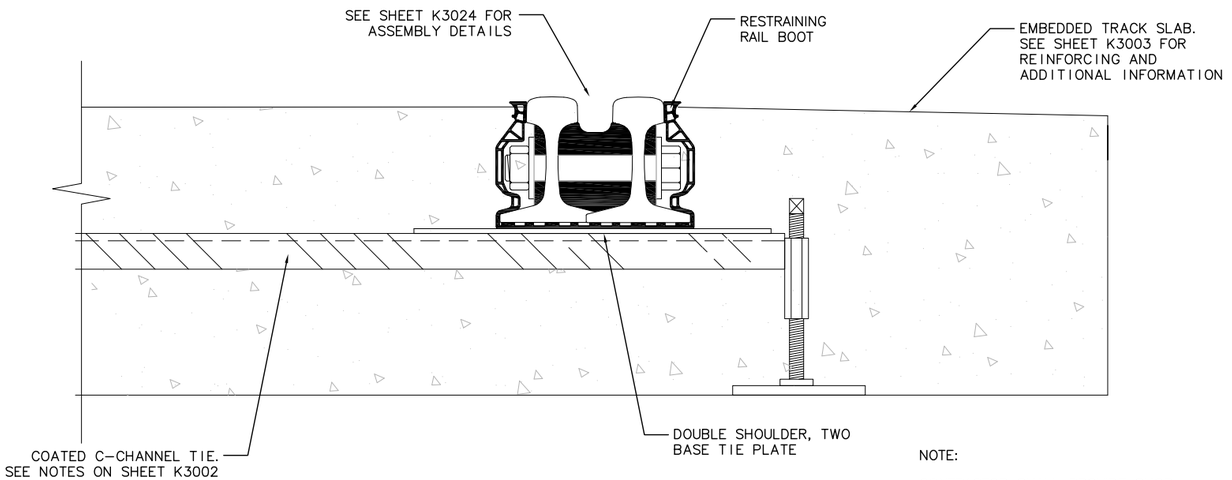
- ● BOLTED JOINT
- ▲ WELDED JOINT

NOTES:

1. REFER TO HORIZONTAL ALIGNMENT DRAWINGS AND TRACK CHART FOR CURVED TRACKS THAT NEED PRE-CURVED RAILS.
2. TYPICAL MARKINGS OF PRE-CURVED RAILS.



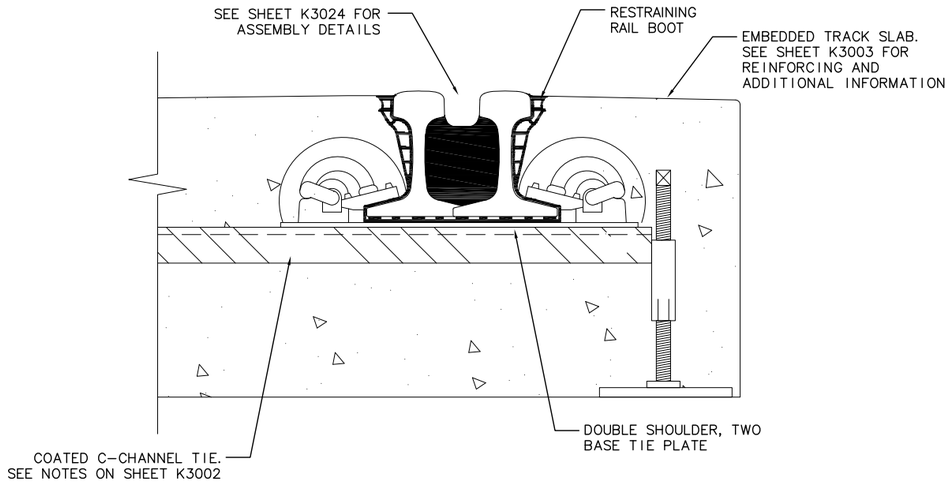
3. FOR 115 RE RESTRAINING RAIL DETAILS SEE SHEET K3024.
4. ALL RAIL ON CURVES WITH RADIUS LESS THAN 300' SHALL BE PRE-CURVED IN A SHOP USING ROLLER BENDING METHOD. JOINTS IN PRE-CURVED RAIL SHALL BE BY EITHER THERMITE WELDING OR BONDED JOINT BARS.
5. SEE NOTES 17 AND 18 ON SHEET K6001 FOR TRACK GAUGE WIDENING FOR CURVES WITH RADIUS LESS THAN 280'.
6. AT CLIP LOCATIONS, CONTRACTOR TO NOTCH OUT BOOT FILLER SECTION TO ALLOW FOR CAP PER MANUFACTURER'S INSTRUCTIONS.



ENLARGED RESTRAINING RAIL SECTION

NOTE:

CONTRACTOR SHALL PROVIDE SHOP DRAWINGS SHOWING RESTRAINING RAIL BOOT DETAILS PRIOR TO INSTALLATION.



ENLARGED RESTRAINING RAIL SECTION @ CLIP

REV	DATE	DESCRIPTION

STATE OF UTAH — Conformed Set 8-13-2010 — PROFESSIONAL ENGINEER

WilburSmith ASSOCIATES; DAVID EVANS AND ASSOCIATES INC.; Steve Greene & Associates, PLLC; Hatch Mott MacDonald

UTA UTAH TRANSIT AUTHORITY

Approved By: _____

Designed By:	J. BLAKE
Drawn By:	R. KOECHLEY
Checked By:	J. BLAKE
Approved By:	S. GREENE

AIRPORT LIGHT RAIL TRANSIT PROJECT

TRACKWORK STANDARDS
RESTRAINING RAIL DETAILS
SHEET 2 OF 2

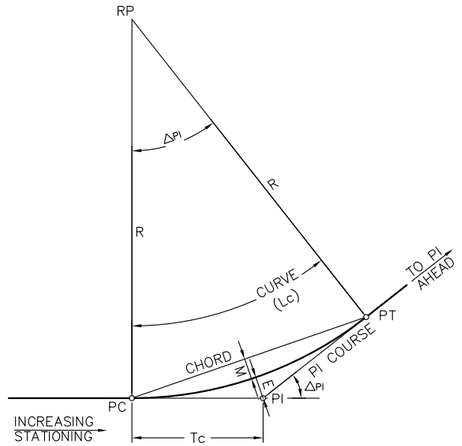
Scale:	NTS
CADD Filename:	APAK3025.DWG
Submittal Date:	JUNE 25, 2010
UTA Contract No.:	UT08-002VT
Drawing No.:	K3025
Sheet	138 ~~51~~

GENERAL TRACKWORK NOTES

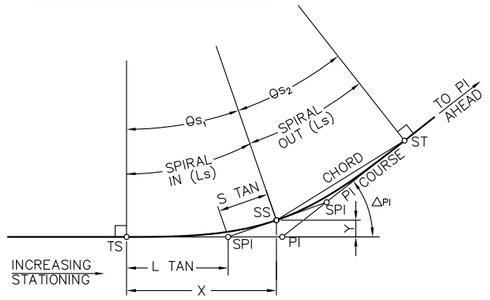
1. FOR PROJECT COORDINATE SYSTEM AND ELEVATION DATUM INFORMATION, REFER TO THE SURVEY CONTROL DRAWINGS.
2. PROPOSED TOP OF RAIL PROFILE SHOWN ON THE PLAN AND PROFILE DRAWINGS IS FOR THE TOP OF RAIL OF THE EB TRACK LOW RAIL UNLESS OTHERWISE NOTED.
3. THE PROPOSED TOP OF RAIL PROFILE FOR THE WB TRACK SHALL MATCH THAT OF THE EB TRACK UNLESS A SEPARATE PROFILE FOR THE WB TRACK IS PROVIDED IN THE DRAWINGS.
4. WHERE TRACKS ARE SUPERELEVATED, TOP OF RAIL ELEVATIONS REFER TO THE LOW RAIL, UNLESS NOTED OTHERWISE, REFER TO SUPERELEVATION DATA SHEET FOR FURTHER INFORMATION.
5. STATIONS SHOWN ON TYPICAL SECTION DRAWINGS ARE APPROXIMATE.
6. "ORIGINAL GROUND" OR "EXISTING GROUND" SHOWN ON PROFILES AND CROSS SECTIONS REFERS TO THE APPROXIMATE EXISTING GROUND LINE AT THE DESIGNATED CENTERLINE, BASELINE, LAYOUT LINE, OR SECTION LINE.
7. WITH THE EXCEPTION OF WB TRACK ALIGNMENT POINTS, ALL STATION CALLOUTS REFER TO THE EB TRACK STATIONING UNLESS OTHERWISE NOTED. EQUIVALENT STATIONS ON THE WB TRACK SHALL BE DETERMINED IN THE FOLLOWING MANNER:

   THE EQUIVALENT STATION OF A POINT ON THE WB TRACK IS THE STATION OF A POINT FORMED BY PROJECTING A LINE PERPENDICULAR TO THE EB TRACK FROM THE POINT ON THE WB TRACK.

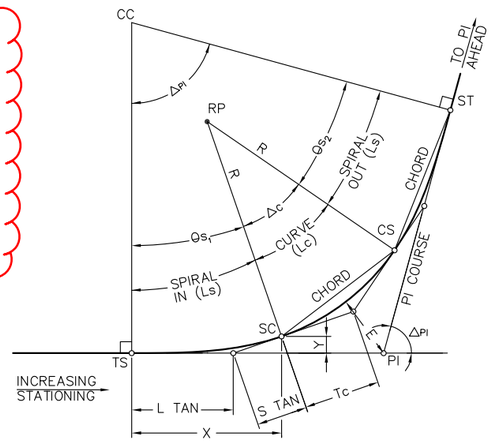
8. WITH THE EXCEPTION OF WB TRACK ALIGNMENT POINTS, STATIONING WITHOUT A LINE DESIGNATION REFERS TO THE EB TRACK CENTERLINE.
9. CURVES AND STATIONING ARE BASED ON ARC DEFINITION.
10. STATIONING FOR TURNOUTS PASS THROUGH THE PITO, NOT ALONG THE CENTERLINE OF THE TURNOUT CURVES.
11. COORDINATE INFORMATION SHALL TAKE PRECEDENCE OVER BEARING AND DISTANCES, WHERE DISCREPANCIES EXIST.
12. HEAD-HARDENED, HIGH-STRENGTH RAIL SHALL BE USED AT ALL AREAS ANTICIPATED TO HAVE A HIGH FREQUENCY OF ACCELERATION AND BRAKING (SUCH AS STATION PLATFORMS), ON STEEP GRADES 5% OR GREATER, THROUGHOUT SPECIAL TRACKWORK LIMITS, AND IN MAINLINE TRACK CURVES WITH RADII OF 900 FEET OR LESS.
13. RESTRAINING RAIL SHALL BE INSTALLED ON THE INNER RUNNING RAIL OF CURVES WITH A RADIUS LESS THAN 300'.
14. ONE EMERGENCY GUARDRAIL IS REQUIRED FOR EACH TRACK AND IT SHALL BE LOCATED INSIDE THE RUNNING RAIL WHICH IS FARTHEST FROM THE EDGE OF THE STRUCTURE OR RETAINING WALL. REFER TO THE TRACK CHARTS FOR STATION LIMITS.
15. RAIL USED IN CURVES WITH A RADIUS EQUAL TO OR LESS THAN 300' SHALL BE PRE-CURVED USING THE STANDARD ROLLER BENDING METHOD.
16. REFER TO SYSTEMS DRAWINGS FOR LOCATIONS OF ALL TRACTION POWER AND SIGNAL CONNECTION BOXES, IMPEDENCE BONDS, LRV DETECTORS, AND ALL OTHER TRACKSIDE EQUIPMENT, AND ASSOCIATED CONDUIT RUNS, FOR INSTALLATION PRIOR TO TRACK SLAB CONSTRUCTION.
17. STANDARD TRACK GAUGE OF 4'-8 1/2" SHALL BE USED FOR STANDARD TRACK AND CURVED TRACK WITH RADIUS GREATER THAN 280'. TRACK GAUGE SHALL BE WIDENED TO 4'-8 3/4" FOR CURVED TRACK WITH A RADIUS SMALLER THAN 280'. 1
18. GAUGE WIDENING SHALL BE AT A RATE OF NOT MORE THAN 1/4" IN A DISTANCE OF 62 FEET, FULL GAUGE WIDENING SHALL BE ACCOMPLISHED ON THE TANGENTS IN APPROACH TO THE POINT OF CURVE AND REMOVED FOLLOWING THE POINT OF TANGENT IN UNSPIRALED CURVES. IN SPIRALED CURVES, GAUGE WIDENING SHALL BE APPLIED AND REMOVED OVER THE LENGTH OF THE SPIRALS. IF THE SPIRAL IS TOO SHORT FOR FULL GAUGE WIDENING TO BE ACCOMPLISHED WITHOUT THE RATE EXCEEDING 1/4" IN 62 FEET, SUFFICIENT GAUGE WIDENING SHALL BE PLACED IN THE APPROACH TANGENTS TO MEET THE RATE OF 1/4" IN 62 FEET. IF ADJACENT CURVES REQUIRING WIDENING ARE TOO CLOSE TOGETHER TO ALLOW RUN OUT OF THE GAUGE WIDENING, THE WIDENED GAUGE SHALL BE MAINTAINED BETWEEN THE CURVES.
19. REFER TO CIVIL PLANS FOR ADDITIONAL ROADWAY IMPROVEMENTS.
20. Eu IDENTIFIED IN THE CURVE TABLES ON THE PLAN AND PROFILE SHEETS IS BASED ON VELOCITY (V) AND NOT THE MAXIMUM ALLOWABLE VELOCITY (MAV). 1



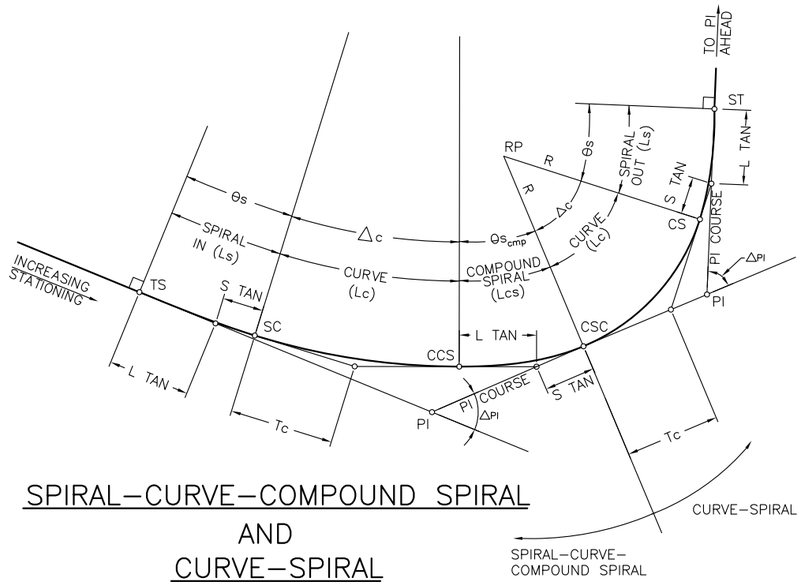
CIRCULAR CURVE



SPIRAL-SPIRAL



SPIRAL-CURVE-SPIRAL



SPIRAL-CURVE-COMPOUND SPIRAL AND CURVE-SPIRAL

CURVE NOTATION:

Lc	LENGTH OF CIRCULAR CURVE
Ls	LENGTH OF SPIRAL CURVE
Lcs	LENGTH OF COMPOUND SPIRAL CURVE
Θs	THETA, DEFLECTION ANGLE OF SPIRAL CURVE
Δc	DELTA, DEFLECTION ANGLE OF CIRCULAR CURVE
ΔPI	DELTA, DEFLECTION ANGLE OF PI
Tc	CIRCULAR CURVE TANGENT LENGTH
L TAN	SPIRAL LONG TANGENT LENGTH
S TAN	SPIRAL SHORT TANGENT LENGTH
R	RADIUS
RP	RADIAL POINT OF CIRCULAR CURVE
E	EXTERNAL DISTANCE
M	MID-ORDINATE
X	TANGENT DISTANCE FROM TS TO SC OR ST TO CS
Y	TANGENT OFFSET AT SC OR CS
DD	DEGREE OF CURVATURE = 5729.58/R (ARC DEFINITION)
CC	CENTER OF CURVATURE
PI	POINT OF INTERSECTION OF OVERALL CURVE
PC	POINT OF CHANGE FROM TANGENT TO CIRCULAR CURVE
PT	POINT OF CHANGE FROM CIRCULAR CURVE TO TANGENT
SC	POINT OF CHANGE FROM SPIRAL TO CIRCULAR CURVE
CS	POINT OF CHANGE FROM CIRCULAR CURVE TO SPIRAL
TS	POINT OF CHANGE FROM TANGENT TO SPIRAL
ST	POINT OF CHANGE FROM SPIRAL TO TANGENT
SS	POINT OF CHANGE FROM SPIRAL TO ANOTHER SPIRAL
PRS	POINT OF REVERSING SPIRALS
CCS	POINT OF CHANGE FROM CURVE TO COMPOUND SPIRAL
CSC	POINT OF CHANGE FROM COMPOUND SPIRAL TO CURVE
POT	POINT ON TANGENT
POC	POINT ON CIRCULAR CURVE
POS	POINT ON SPIRAL
SP1	POINT OF INTERSECTION SPIRAL

REV	DATE	DESCRIPTION
1	06.22.10	DM#0026 – K6001 SHEET CHANGES

STATE OF UTAH – Conformed Set 8-13-2010 – LONG PROFESSIONAL ENGINEER

WilburSmith ASSOCIATES; DAVID EVANS AND ASSOCIATES INC.; Steve Greene & Associates, PLLC; Hatch Mott MacDonald

UTA – UTAH TRANSIT AUTHORITY

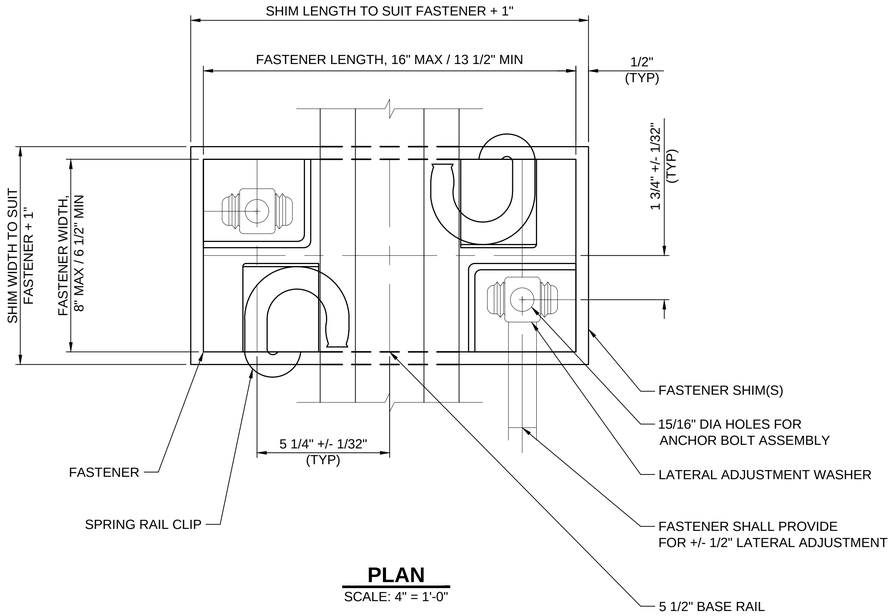
Approved By: _____

Designed By:	J. BLAKE
Drawn By:	J. DINSMORE
Checked By:	J. BLAKE
Approved By:	S. GREENE

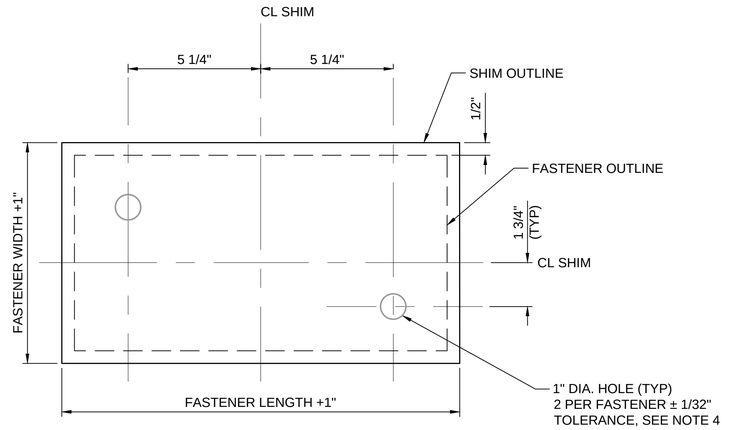
AIRPORT LIGHT RAIL TRANSIT PROJECT

GENERAL TRACKWORK NOTES, CURVE DIAGRAMS AND NOTATIONS

Scale:	NTS
CADD Filename:	APAK6001.DWG
Submittal Date:	JUNE 25, 2010
UTA Contract No.:	UT08-002VT
Drawing No.:	K6001
Sheet	168 (~~101~~)



PLAN
SCALE: 4" = 1'-0"



SHIM SHAPE AND HOLES SHALL BE COMPATIBLE WITH FASTENER SHAPE, SIZE & ANCHOR BOLT LOCATION.
MATERIAL: HIGH DENSITY POLYETHYLENE (HDPE)

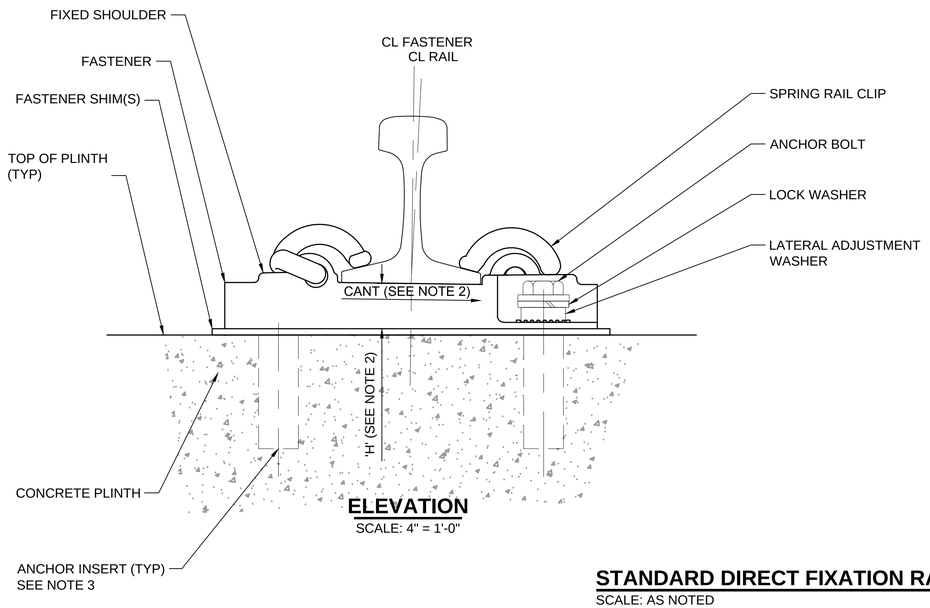
STANDARD SHIM CONFIGURATION
THICKNESSES: 1/16",1/8", 3/16", 1/4"
SCALE: 4" = 1'-0"

NOTES:

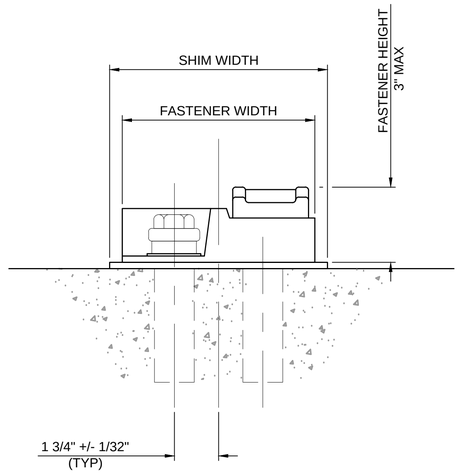
1. TOTAL NUMBER OF SHIMS PLACED UNDER RAIL FASTENER BODY FOR HEIGHT ADJUSTMENT SHALL BE LIMITED TO A MAXIMUM OF TWO SHIMS AND A MAXIMUM TOTAL THICKNESS OF 1/2".
2. STANDARD DIRECT FIXATION FASTENER SHOULD BE SUPPLIED WITH TWO TYPES OF CONFIGURATIONS:
   - 2.1. STANDARD DF FASTENERS WITH RAIL SEAT CANTED 1:40 FOR FASTENING RAIL ON MAINLINE PRIMARY TRACK. H=1 7/8"
   - 2.2. STANDARD DF FASTENERS WITH RAIL SEAT NON CANTED FOR FASTENING SINGLE RAIL WITHIN THE LIMIT OF TURNOUT AND CROSSOVER. H=1 1/2"
3. FOR ANCHOR INSERT DETAILS, SEE DWG L90-KAD103.
4. A MINIMUM OF ONE STANDARD SHIM SHALL BE PLACED UNDER EACH FASTENER. HOLE SHAPES FOR ADDITIONAL ADJUSTMENT SHIMS MAY BE SLOTTED PER MANUFACTURER RECOMMENDATIONS.

E-Clip DF Fasteners with HDPE Shim similar to Sound Transit Downtown Redmond Link Project.

Fastener Spacing
Curves over 755 FT Radius: 30" OC
Curves 755 to 300 FT: 27" OC
(Normally 500 FT Radius is upper limit but the curves between 500 to 755 FT Radius are compound curves between curves under 500 FT)
Curves 300 and Under: 24" OC with Restraining Rail on Inside Rail



ELEVATION
SCALE: 4" = 1'-0"



ELEVATION (NO RAIL OR CLIPS)
SCALE: 4" = 1'-0"

STANDARD DIRECT FIXATION RAIL FASTENER 1
SCALE: AS NOTED

No.	DATE	DSN	CHK	APP	REVISION
0	06/14/2021	JS	DC	JS	ISSUED FOR CONSTRUCTION

DESIGNED BY: J. SERA
DRAWN BY: M. REN
CHECKED BY: D. CERNEY
APPROVED BY: J. SERA
REVIEWED BY: J. SCHETTLER
SUBMITTED BY: R. GLEFFE
LINE IS 1" AT FULL SCALE
SCALE: 4" = 1'-0"
FILENAME: R200-L90-KAD100
CONTRACT No.: RTA/CN 0148-18
DATE: 06/14/2021
DESIGN PACKAGE: HCGS
PERMIT INFORMATION:

DOWNTOWN REDMOND LINK EXTENSION
CONTRACT R200
REDMOND TECH STATION TO DOWNTOWN REDMOND
TRACKWORK - DIRECT FIXATION
STANDARD FASTENER DETAILS

DRAWING No.: L90-KAD100
FACILITY ID: L90
SHEET No.: 0092
REV: 0

Xrefs:
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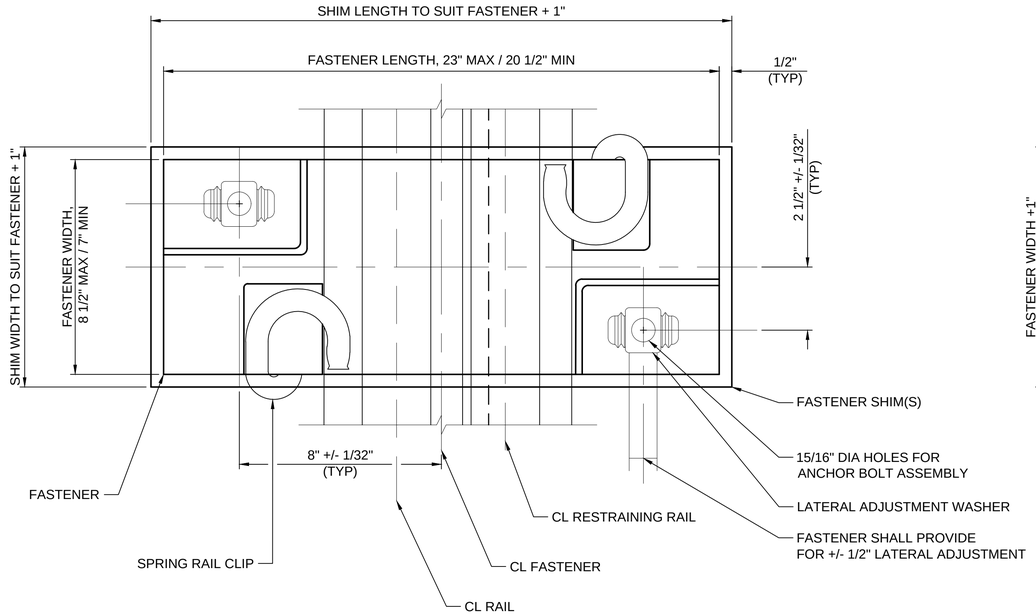
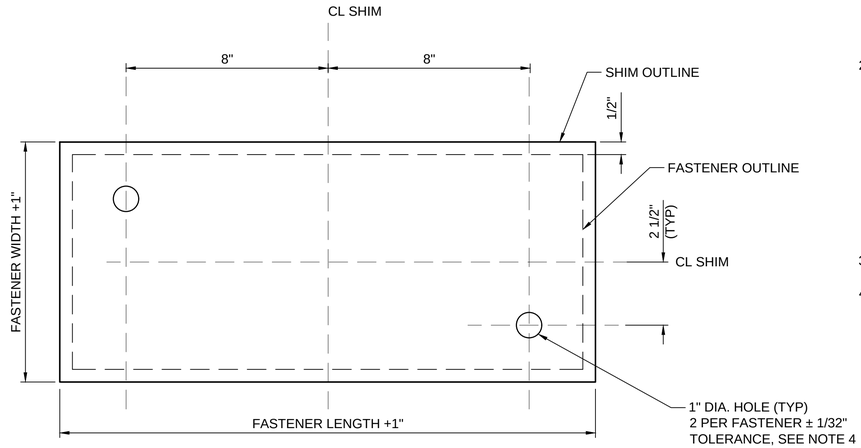
xR200-GEN-TB22x34



PLAN VIEW
SCALE: 4" = 1'-0"



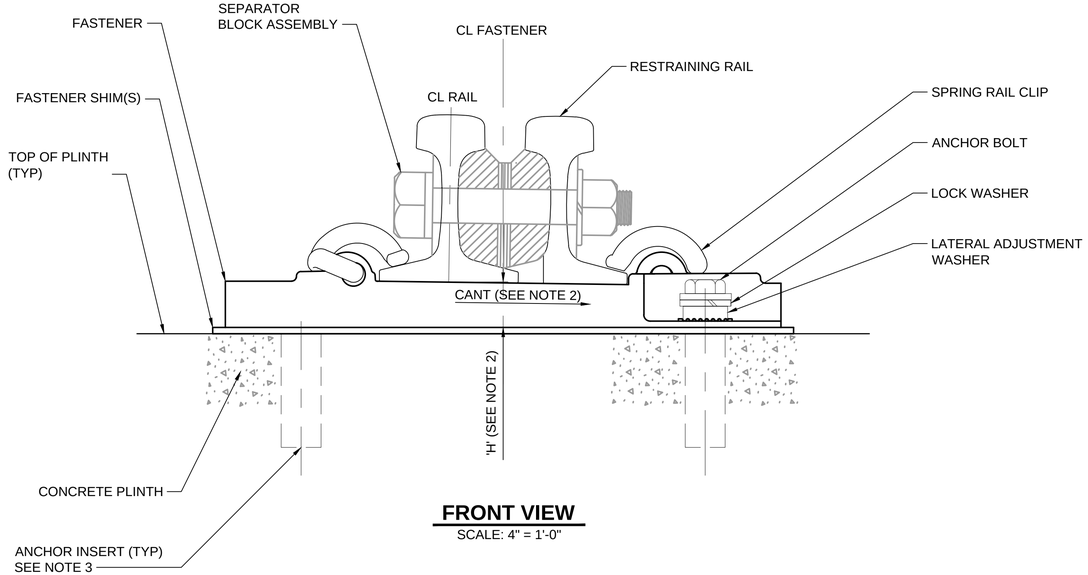
SHIM SHAPE AND HOLES SHALL BE COMPATIBLE WITH FASTENER SHAPE, SIZE & ANCHOR BOLT LOCATION.
MATERIAL: HIGH DENSITY POLYETHYLENE (HDPE)

STANDARD SHIM CONFIGURATION
THICKNESSES: 1/16", 1/8", 3/16", 1/4"
SCALE: 4" = 1'-0"

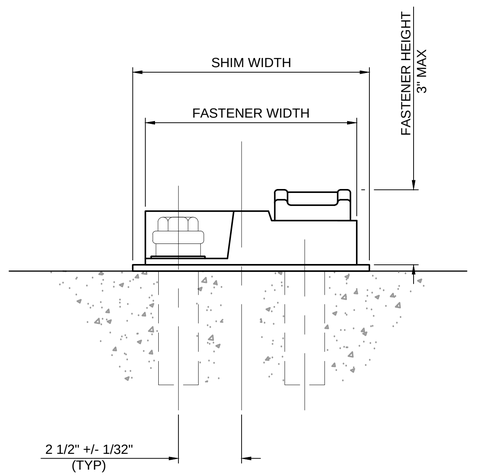
NOTES:

1. TOTAL NUMBER OF SHIMS PLACED UNDER RAIL FASTENER BODY FOR HEIGHT ADJUSTMENT SHALL BE LIMITED TO A MAXIMUM OF TWO SHIMS AND A MAXIMUM TOTAL THICKNESS OF 1/2 ".
2. STANDARD DIRECT FIXATION FASTENER SHOULD BE SUPPLIED WITH TWO TYPES OF CONFIGURATIONS:
   - 2.1. STANDARD FASTENERS WITH RAIL SEAT CANTED 1:40 FOR FASTENING RAIL ON MAINLINE PRIMARY TRACK. H=1 7/8"
   - 2.2. STANDARD SPECIAL TRACKWORK FASTENERS WITH RAIL SEAT NON CANTED FOR FASTENING SINGLE RAIL WITHIN THE LIMIT OF TURNOUT AND CROSSOVER. H=1 1/2"
3. FOR ANCHOR INSERT DETAILS, SEE DWG L90-KAD103.
4. A MINIMUM OF ONE STANDARD SHIM SHALL BE PLACED UNDER EACH FASTENER. HOLE SHAPES FOR ADDITIONAL ADJUSTMENT SHIMS MAY BE SLOTTED PER MANUFACTURER RECOMMENDATIONS.

E-Clip DF Restraining Rail Fasteners with HDPE Shim similar to Sound Transit Downtown Redmond Link Project.



FRONT VIEW
SCALE: 4" = 1'-0"



SIDE VIEW (NO RAIL OR CLIPS)
SCALE: 4" = 1'-0"

RESTRAINING RAIL DF RAIL FASTENER
SCALE: AS NOTED

1 / -

No.	DATE	DSN	CHK	APP	REVISION
0	06/14/2021	JS	DC	JS	ISSUED FOR CONSTRUCTION

DESIGNED BY: J. SERA
DRAWN BY: M. REN
CHECKED BY: D. CERNEY
APPROVED BY: J. SERA
REVIEWED BY: J. SCHETTLER
SUBMITTED BY: R. GLEFFE
LINE IS 1" AT FULL SCALE
SCALE: 4" = 1'-0"
FILENAME: R200-L90-KAD101
CONTRACT No.: RTA/CN 0148-18
DATE: 06/14/2021
DESIGN PACKAGE: HCGS
PERMIT INFORMATION:

DOWNTOWN REDMOND LINK EXTENSION
CONTRACT R200
REDMOND TECH STATION TO DOWNTOWN REDMOND
TRACKWORK - DIRECT FIXATION
STANDARD RESTRAINING RAIL
FASTENER DETAILS

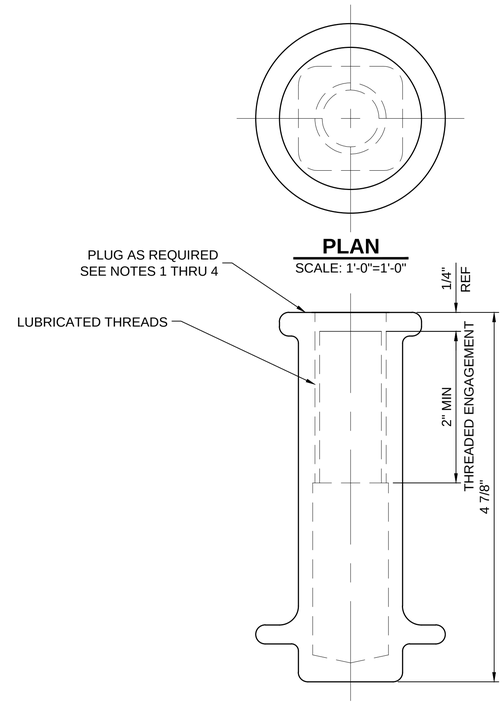
DRAWING No.: L90-KAD101
FACILITY ID: L90
SHEET No.: 0093
REV: 0

DRLE-Plot_UTB_v3.scr
05/20/21 | 8:46 PM | RENM
C:\PW\WORKING\DRLE_SUPPORTFILES_PLOTTING\PP\R200-L90-KAD101.DWG

NOTES:

1. INSTALL PLUG INSERTS DURING CONSTRUCTION TO KEEP THE INSERTS CLEAN AND FREE OF FOREIGN MATERIAL.
2. THIN PLASTIC PUSH-IN THIMBLE TYPE PLUGS MAY BE USED FOR TEMPORARY PROTECTION OF THE THREADS AT THE CONTRACTORS OPTION. HOWEVER, THIN PLASTIC PUSH-IN THIMBLE TYPE PLUGS MAY NOT BE USED AS PERMANENT PLUGS ON INSERTS THAT ARE LEFT OPEN.
3. INSERTS THAT ARE LEFT OPEN AT THE CONCLUSION OF THE PROJECT SHALL BE PLUGGED WITH A REMOVABLE THREADED PLUG THAT IS FLUSH TO THE ADJACENT CONCRETE SURFACE.
4. PLUGS TO HAVE EITHER HEX OR SQUARE RECESS FOR WRENCH.
5. ANCHOR BOLTS SHALL BE CENTERED ON THEIR LOCKING WASHER +/- 1/8"

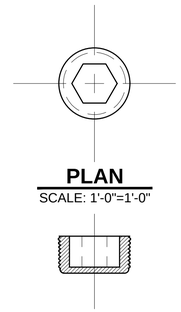
DF Fastener Epoxy Coated Anchor similar to Sound Transit Downtown Redmond Link Project.



PLAN
SCALE: 1'-0"=1'-0"

ELEVATION
SCALE: 1'-0"=1'-0"

ANCHOR INSERT 1
SCALE AS NOTED



PLAN
SCALE: 1'-0"=1'-0"

ELEVATION
SCALE: 1'-0"=1'-0"

THREADED PLUG 2
SCALE AS NOTED

No.	DATE	DSN	CHK	APP	REVISION
0	06/14/2021	JS	DC	JS	ISSUED FOR CONSTRUCTION

DESIGNED BY: J. SERA
DRAWN BY: M. REN
CHECKED BY: D. CERNEY
APPROVED BY: J. SERA

JOLENE SERA — STATE OF WASHINGTON — 19919 — REGISTERED PROFESSIONAL ENGINEER — 06/09/21

Jacobs
REVIEWED BY: J. SCHETTLER

SWK Stacy and Witbeck / Kuney
SUBMITTED BY: R. GLEFFE

SOUNDTRANSIT
LINE IS 1" AT FULL SCALE

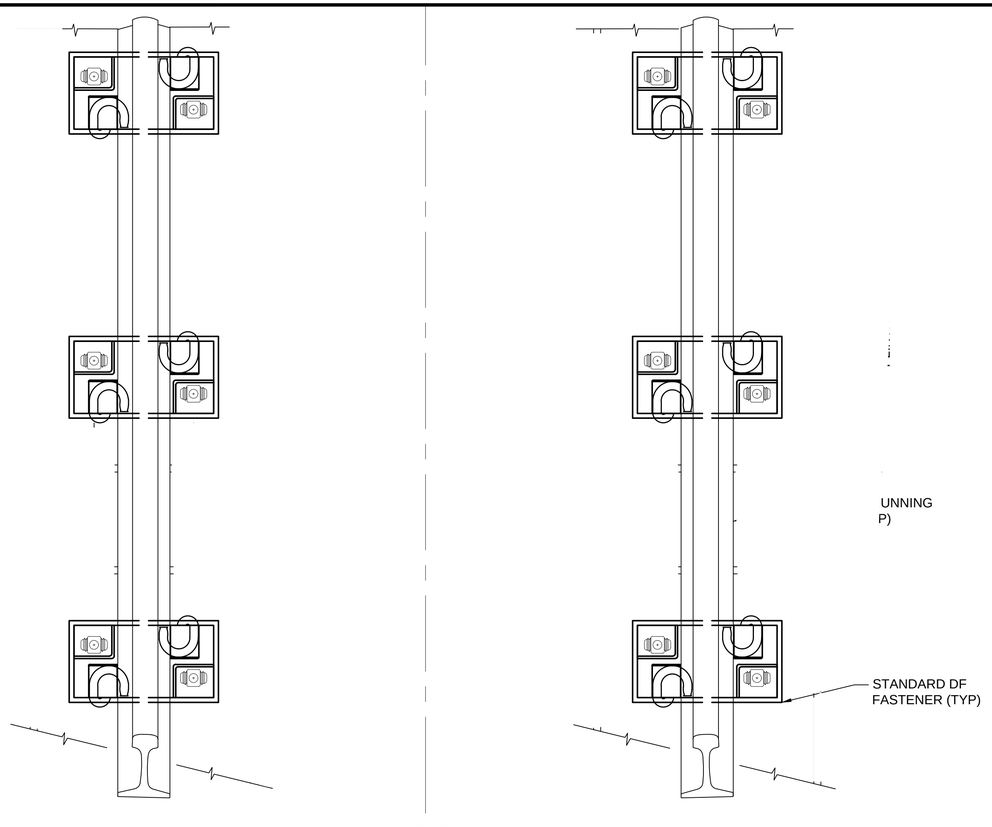
SCALE: 1'-0" = 1'-0"
FILENAME: R200-L90-KAD103
CONTRACT No.: RTA/CN 0148-18
DATE: 06/14/2021

DESIGN PACKAGE: HCGS
PERMIT INFORMATION:

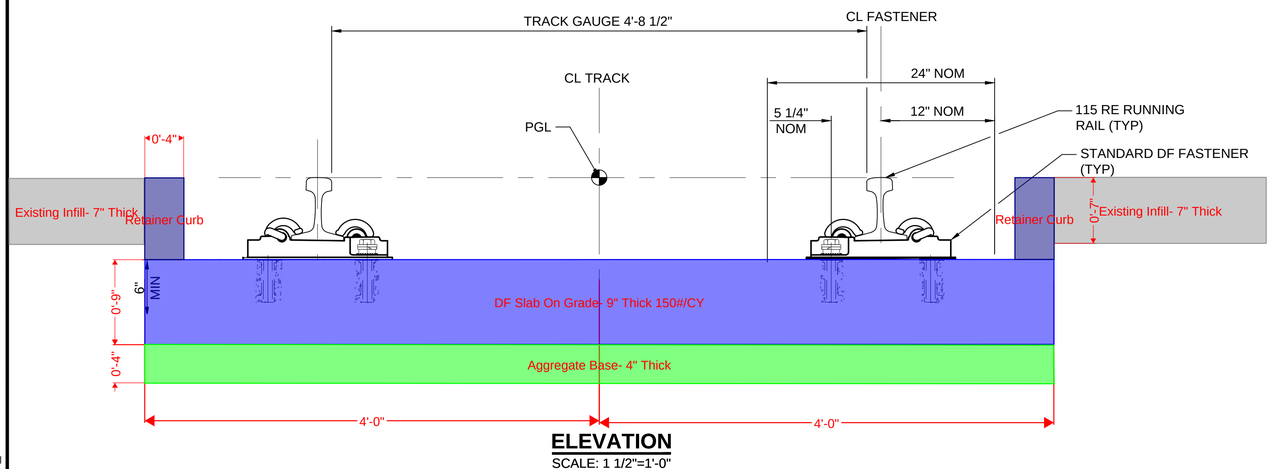
DOWNTOWN REDMOND LINK EXTENSION
CONTRACT R200
REDMOND TECH STATION TO DOWNTOWN REDMOND
TRACKWORK - DIRECT FIXATION
PLINTH ANCHOR INSERT DETAILS

DRAWING No.: L90-KAD103
FACILITY ID: L90
SHEET No.: 0094
REV: 0

Xrefs:
GB-SEAL-JS49219
xR200-GEN-TB22x34



PLAN
SCALE: 1 1/2"=1'-0"



ELEVATION
SCALE: 1 1/2"=1'-0"

DIRECT FIXATION TANGENT TRACK WITHOUT EMERGENCY GUARD RAIL INSTALLATION

1
-

SCALE AS NOTED

DF Slab on Grade, No Plinths for S-Curve Replacement.

No.	DATE	DSN	CHK	APP	REVISION
0	06/14/2021	JS	DC	JS	ISSUED FOR CONSTRUCTION

DESIGNED BY: J. SERA
DRAWN BY: M. REN
CHECKED BY: D. CERNEY
APPROVED BY: J. SERA

JOLENE SERA — STATE OF WASHINGTON — 22219 — REGISTERED PROFESSIONAL ENGINEER — 06/09/21

Jacobs
REVIEWED BY: J. SCHETTLER

SWK Stacy and Witbeck / Kuney
SUBMITTED BY: R. GLEFFE

SOUNDTRANSIT
LINE IS 1" AT FULL SCALE

SCALE: AS NOTED
FILENAME: R200-L90-KAD104
CONTRACT No.: RTA/CN 0148-18
DATE: 06/14/2021

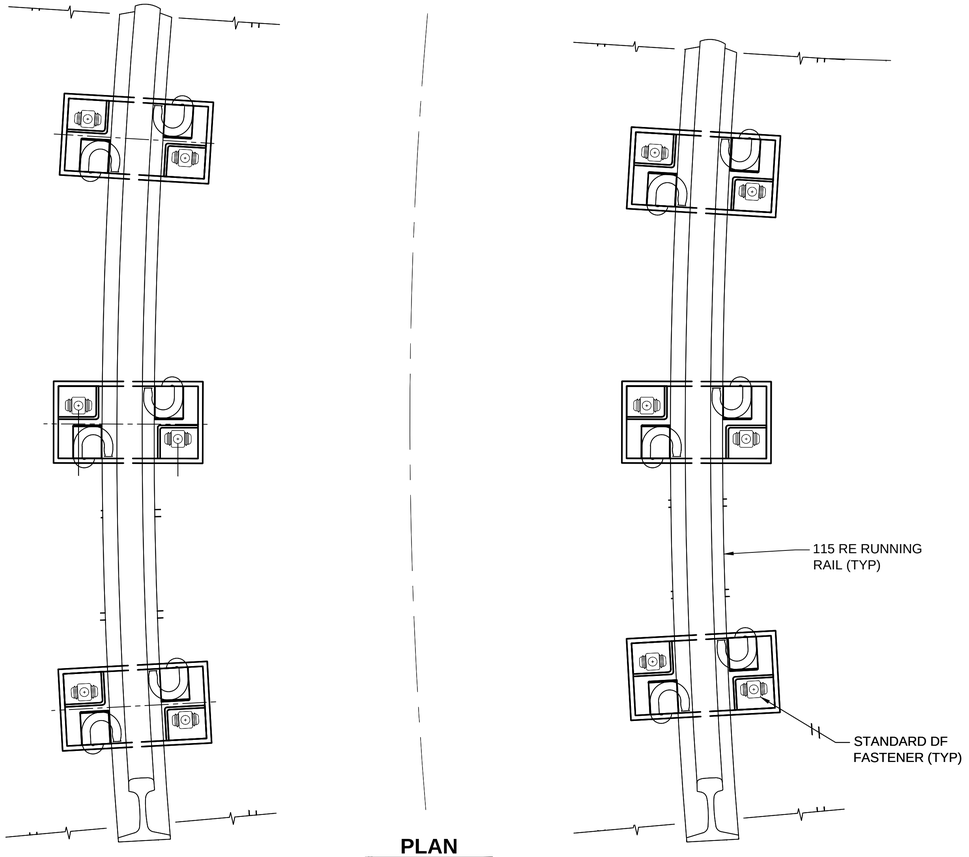
DESIGN PACKAGE: HCGS
PERMIT INFORMATION:

DOWNTOWN REDMOND LINK EXTENSION
CONTRACT R200
REDMOND TECH STATION TO DOWNTOWN REDMOND
TRACKWORK - DIRECT FIXATION
TANGENT TRACK
WITHOUT EMERGENCY GUARD RAIL DETAILS

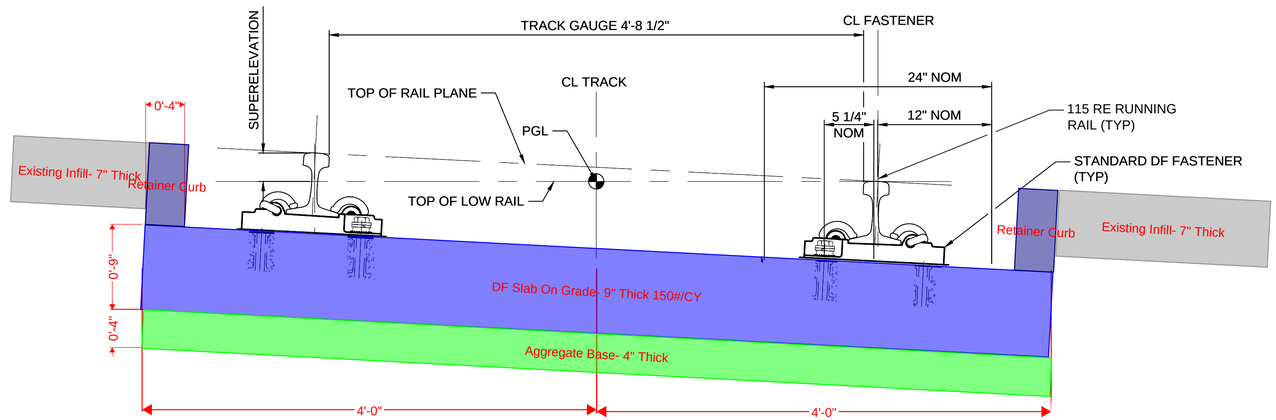
DRAWING No.: **L90-KAD104**
FACILITY ID: L90
SHEET No.: 0095
REV: 0

DRLE-Plot_UTB_v3.scr
05/20/21 | 8:48 PM | RENM
C:\PWWORKING\DRLE_SUPPORTFILES_PLOTTING\PP\R200-L90-KAD104.DWG

DF Slab on Grade, No Plinths for
S-Curve Replacement.



PLAN
SCALE: 1 1/2"=1'-0"



ELEVATION
SCALE: 1 1/2"=1'-0"

DIRECT FIXATION CURVED AND SUPERELEVATED TRACK WITH RADIUS > 500 FT WITHOUT EMERGENCY GUARD RAIL INSTALLATION

1
-

SCALE AS NOTED

No.	DATE	DSN	CHK	APP	REVISION
0	06/14/2021	JS	DC	JS	ISSUED FOR CONSTRUCTION

DESIGNED BY: J. SERA
DRAWN BY: M. REN
CHECKED BY: D. CERNEY
APPROVED BY: J. SERA

JOLENE SERA — STATE OF WASHINGTON — 22219 — REGISTERED PROFESSIONAL ENGINEER — 06/09/21

Jacobs
REVIEWED BY: J. SCHETTLER

SWK Stacy and Witbeck / Kuney
SUBMITTED BY: R. GLEFFE

SOUNDTRANSIT
LINE IS 1" AT FULL SCALE

SCALE: AS NOTED
FILENAME: R200-L90-KAD105
CONTRACT No.: RTA/CN 0148-18
DATE: 06/14/2021

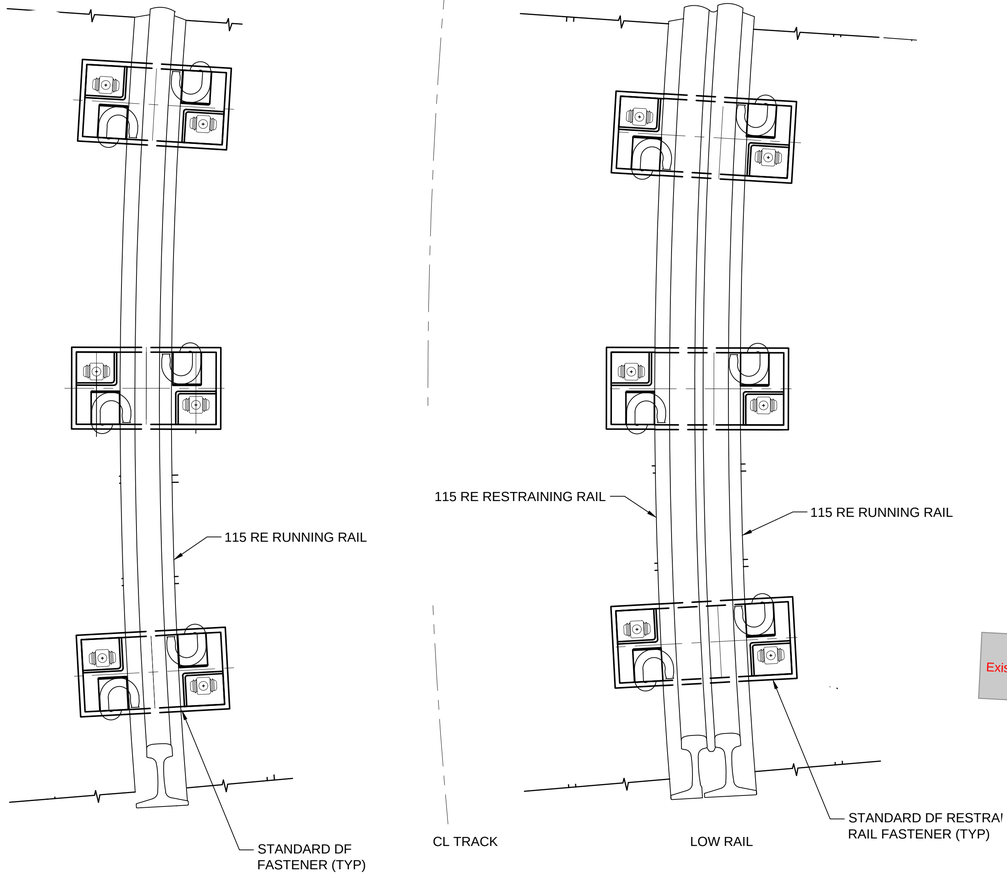
DESIGN PACKAGE: HCGS
PERMIT INFORMATION:

DOWNTOWN REDMOND LINK EXTENSION
CONTRACT R200
REDMOND TECH STATION TO DOWNTOWN REDMOND

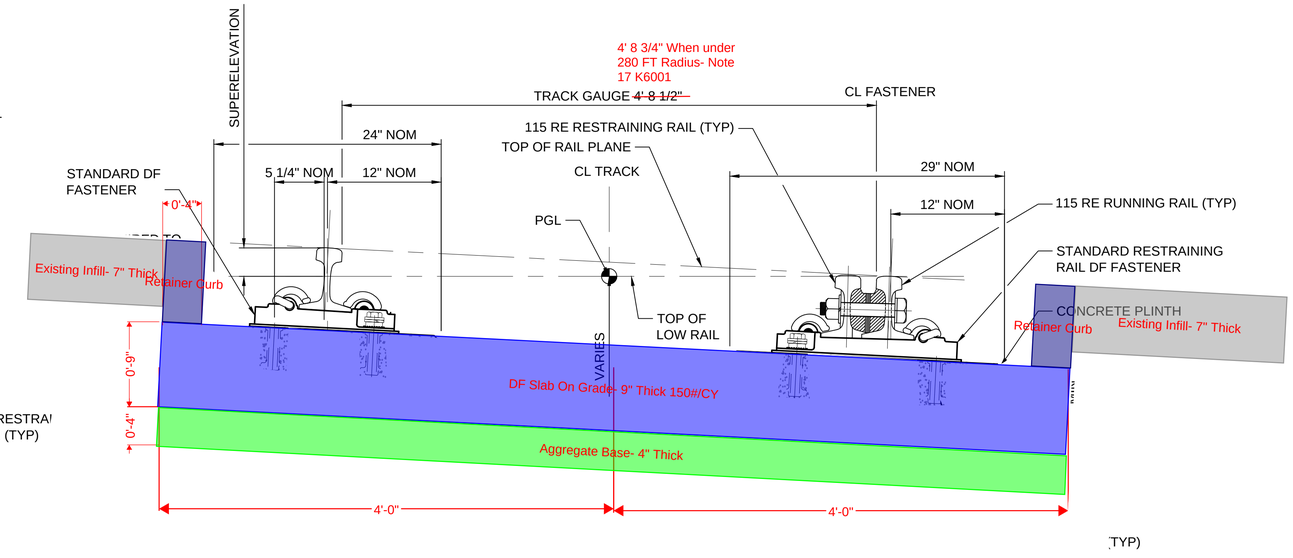
TRACKWORK - DIRECT FIXATION
CURVED TRACK, RADIUS > 500 FEET
WITHOUT EMERGENCY GUARD RAIL DETAILS

DRAWING No.: **L90-KAD105**
FACILITY ID: L90
SHEET No.: 0096
REV: 0

DF Slab on Grade, No Plinths for
S-Curve Replacement.



PLAN
SCALE: 1 1/2"=1'-0"



ELEVATION
SCALE: 1 1/2"=1'-0"

DIRECT FIXATION CURVED AND SUPERELEVATED TRACK WITH RADIUS Ò500 FT WITH RESTRAINING RAIL INSTALLATION

1
-

SCALE AS NOTED

No.	DATE	DSN	CHK	APP	REVISION
0	06/14/2021	JS	DC	JS	ISSUED FOR CONSTRUCTION

DESIGNED BY: J. SERA
DRAWN BY: M. REN
CHECKED BY: D. CERNEY
APPROVED BY: J. SERA

JOLENE SERA — STATE OF WASHINGTON — 06/09/21 — REGISTERED PROFESSIONAL ENGINEER

Jacobs
REVIEWED BY: J. SCHETTLER

SWK Stacy and Witbeck / Kuney
SUBMITTED BY: R. GLEFFE

SOUNDTRANSIT
LINE IS 1" AT FULL SCALE

SCALE: AS NOTED
FILENAME: R200-L90-KAD108
CONTRACT No.: RTA/CN 0148-18
DATE: 06/14/2021

DESIGN PACKAGE: HCGS
PERMIT INFORMATION:

DOWNTOWN REDMOND LINK EXTENSION
CONTRACT R200
REDMOND TECH STATION TO DOWNTOWN REDMOND

TRACKWORK - DIRECT FIXATION
CURVED TRACK, RADIUS < 500 FEET
WITH RESTRAINING RAIL DETAILS

DRAWING No.: L90-KAD108
FACILITY ID: L90
SHEET No.: 0099
REV: 0