

California High-Speed Train Project



TECHNICAL MEMORANDUM

TYPICAL CROSS SECTIONS FOR 15% DESIGN TM 1.1.21

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System Level Technical and Integration Reviews

The purpose of the review is to ensure:

- Technical consistency and appropriateness
- Check for integration issues and conflicts

System level reviews are required for all technical memorandums. Technical Leads for each subsystem are responsible for completing the reviews in a timely manner and identifying appropriate senior staff to perform the review. Exemption to the System Level technical and integration review by any Subsystem must be approved by the Engineering Manager.

System Level Technical Reviews by Subsystem:

Systems:	<u>Signed document on file</u> Eric Scotson	<u>28 Feb 09</u> Date
Infrastructure:	<u>Signed document on file</u> John Chirco	<u>14 Feb 09</u> Date
Operations:	<u>Signed document on file</u> Paul Mosier	<u>06 Mar 09</u> Date
Maintenance:	<u>Signed document on file</u> Paul Mosier	<u>06 Mar 09</u> Date
Rolling Stock:	<u>Signed document on file</u> Frank Banko	<u>27 Feb 08</u> Date

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APPENDIX A: TYPICAL CROSS SECTIONS FOR 15% DESIGN

APPENDIX B: SUPPLEMENTAL CRITERIA IN SHARED RAIL CORRIDORS

ABSTRACT

Typical cross-sections for 15% design are used to define the guideway to be constructed along the high-speed train alignment, assess the required right-of-way, and prepare capital cost estimates. Schematic cross sections were previously developed as part of the programmatic EIR/EIS in order to advance environmental assessment. This technical memorandum presents HST footprint-level cross sections to be used in advancing the 15% alignment design. Typical cross sections with additional detail will be required to advance the project to the 30% design.

Typical sections for the following high-speed rail conditions will be addressed in this document:

- Two Track At-Grade
- Intermediate Stations
- Rail-Shared Corridors
- Elevated / Aerial Guideway
- Trench / Retained Cut
- Single Track Formations
- Four Track At-Grade

This technical memorandum uses international high-speed train network best practices in developing CHSTP performance criteria. Typical cross sections meet the following high-speed-train requirements:

- Preserving contact between train wheels and rails under all circumstances
- Integration of comfort criteria for passengers while limiting track deformation, air pressure variation, and providing for the mitigating high-speed train noise, where required
- Conditions required for line operation and train regularity
- Inspection and maintenance of the high-speed line
- Ensure drainage of rain water
- Promote efficient execution of earthworks and track installation
- Reduce quantity of ballast or concrete to lay under the track
- Control access to the operating infrastructure
- Allow sufficient space for maintenance of track infrastructure and systems elements in order to limit operational disruptions during inspection and light maintenance activities.

Typical cross-sections will be refined and presented in detail in standard drawings that will be issued at a later stage.

6.0 DESIGN MANUAL CRITERIA

6.1 15% DESIGN CROSS SECTIONS

Typical high-speed rail configurations have been developed to assist in defining the general footprint of the high-speed line, assessing right-of-way requirements, and determine preliminary quantities. These cross sections are developed for at grade and tangent alignments. Note that these cross sections are schematic and are intended to define typical minimum space requirements and not a specific design. The right-of-way required along all segments of the high-speed rail alignment will depend upon actual conditions, including terrain that may require cut/fill slopes, retaining structures, and access requirements.

Typical sections for the following basic high-speed rail conditions are presented in Appendix A:

- Two Track At-Grade
- Intermediate Stations
- Rail-Shared Corridors
- Elevated / Aerial Guideway
- Trench / Retained Cut
- Single Track Formations
- Four Track At-Grade

6.1.1 Clearances

See Structure Gauges Technical Memorandum.

6.1.2 Track Centers

The distance between the center lines of main line tracks is given in the Table 6.1 and is based on design speed. Variation in the distance between track centers on parallel alignments shall be avoided to the extent practical.

Design Speed		Minimum Track Centers, High-Speed Main Tracks					
		Desirable		Minimum		Exceptional	
miles per hour	km/h	feet - inches	mm	feet - inches	mm	feet - inches	mm
>125 – 250	>200 – 400	16.50 ft	5030	16.50 ft	5030	16.50 ft	5030
≤ 125	≤ 200	16.50 ft	5030	15.00 ft	4572	14.00 ft	4496

**Table 6.1 – Distance between Mainline Track Centers
For CHSTP**

The track center between a mainline track and the closest passing track is given in Table 6.2.

	Desirable	Minimum	Exceptional
With OCS Pole	30.00 ft (9.15 m)	26.00 ft (7.90 m)	22.00 ft (6.71 m)
With Portal Structure	25.00 ft (7.62 m)	22.00 ft (6.71 m)	21.30 ft (6.50 m)

**Table 6.2 – Minimum Track Centers between Mainline
and Passing Tracks for CHSTP**

6.1.3 Overhead Contact System (OCS) Poles

The overhead contact system (OCS) poles shall clear the dynamic envelope of the rolling stock without being too far from the center line in order to avoid stress to the OCS pole due to the contact tension.

The distance between the center line of the OCS pole and the center line of the adjacent track shall be 10.67 ft (3.25 m). Placing OCS poles between high-speed mainline tracks is undesirable and should be avoided.

A nominal width of the OCS pole footing shall be 3.00 ft (36 inches) wide for 15% design.

6.1.4 Walkways

A walkway shall be provided on both sides of a high-speed railway with a double track formation and on one side of a single track formation with the inside edge of the walkway at the outside limit of the OCS pole foundation.

CHST walkways shall have a width of:

- Desirable: 3.00 ft
- Minimum: 3.00 ft
- Exceptional: 2.50 ft

6.1.5 Drainage Requirement

A 3-foot-wide area, the edge of which is located 3 feet (min.) from the OCS pole center line shall be reserved on both sides of a double track formation or on one side of a single track formation for drainage purposes.

6.1.6 Systems Elements Requirement

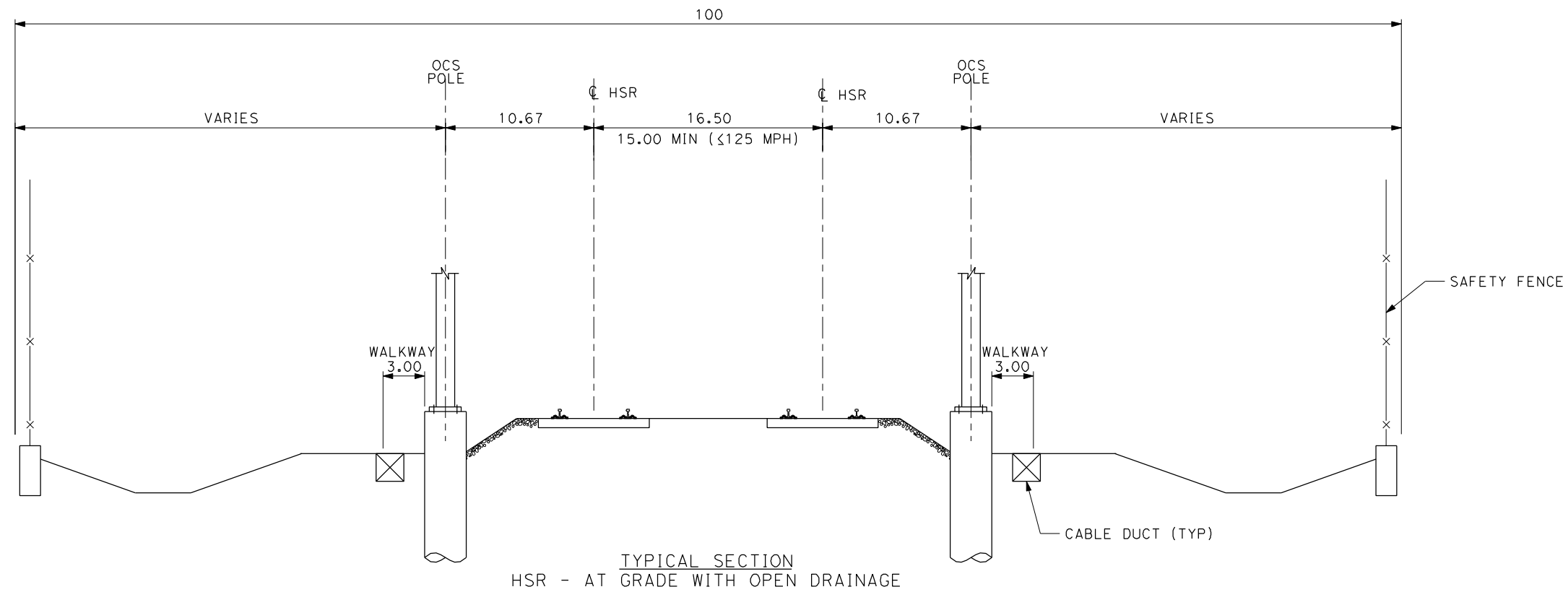
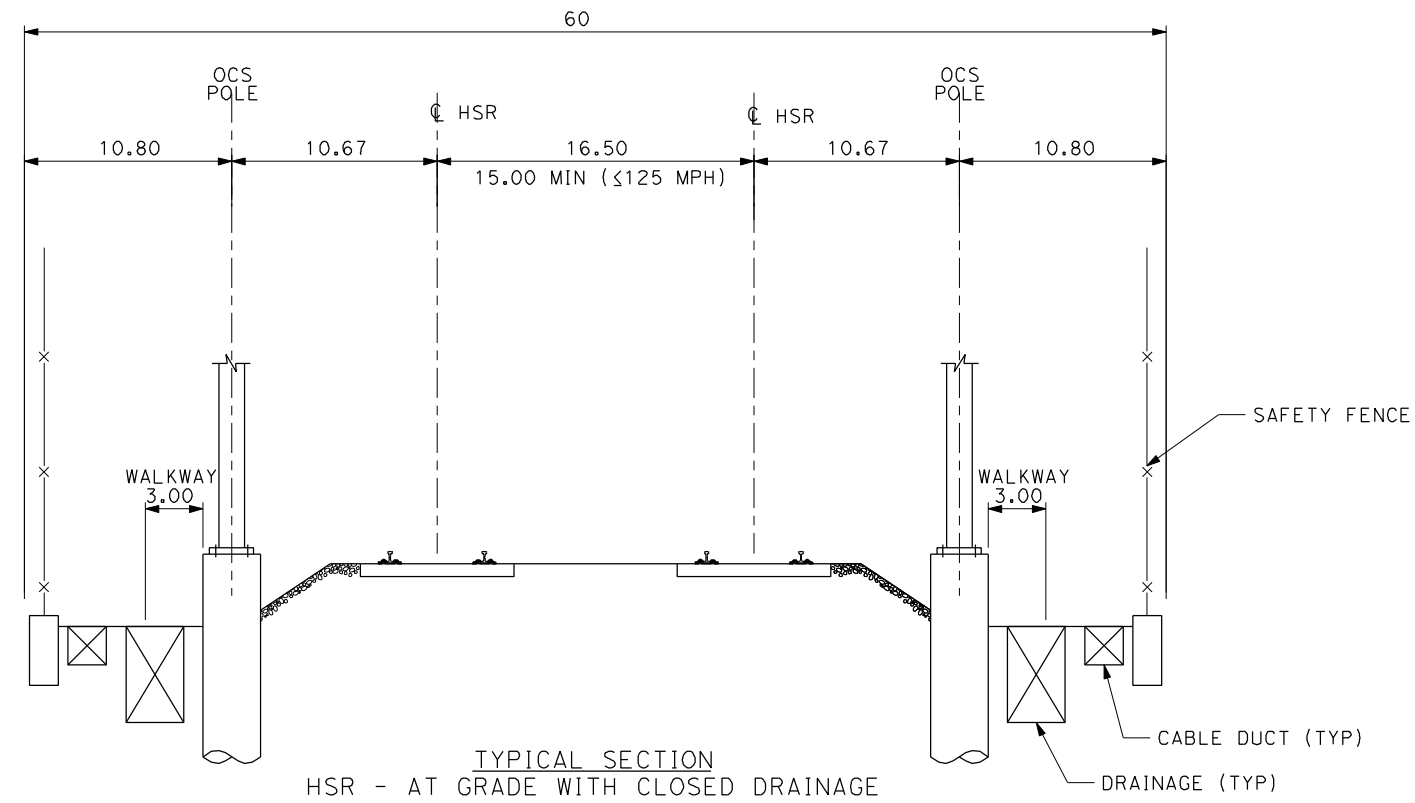
A 3-foot-wide area located on both sides of a double track formation or on one side of a single track formation at the edge of the sub ballast layer shall be preserved for cable ducts and system equipment.

6.1.7 Access Control

High-speed train right-of-way shall have fully controlled access to prevent trespassing by humans and animals. Permanent right-of-way fencing shall include access gates for maintenance personnel and construction contractors, maintenance vehicles and emergency vehicles. Typical right-of-way fencing is assumed to be 8.00 ft high minimum and its footing is assumed to be no less than 1.50 ft (18 inches) wide.

APPENDIX A - Typical Cross Sections for 15% Design

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NOTES:

1. TRACK, OCS POLES AND FOUNDATIONS, CABLE DUCTS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
2. RIGHT-OF-WAY REQUIRED FOR THE HIGH-SPEED RAIL GUIDEWAY WILL DEPEND UPON CONDITIONS ALONG THE ALIGNMENT, INCLUDING TERRAIN, WHERE CUT/FILL SLOPES, RETAINING STRUCTURES, AND ACCESS ARE REQUIRED.



REV	DATE	BY	SUB	APP	DESCRIPTION

INTERNAL DRAFT

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P. DO

CHECKED BY
J. CHIRCO

IN CHARGE
K. JONG

DATE
4-01-09

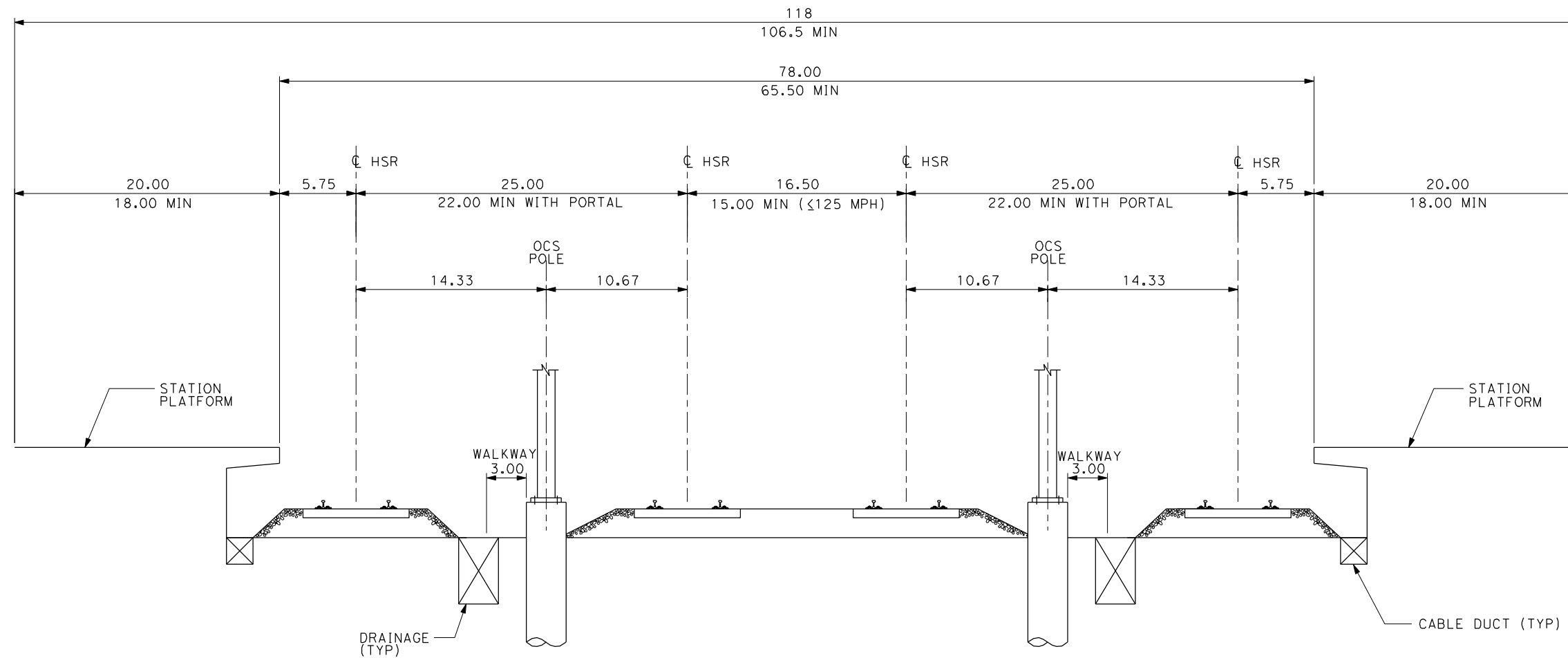
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CALIFORNIA HIGH-SPEED TRAIN PROJECT

HSR TWO TRACK AT-GRADE

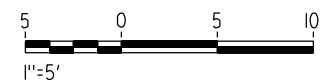
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TYPICAL SECTION
4-TRACK INTERMEDIATE STATION
OUTSIDE BOARDING PLATFORMS

NOTES:

1. TRACK, OCS POLES AND FOUNDATIONS, CABLE DUCTS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
2. OCS POLES AT PASSENGER STATIONS ON A SINGLE MAST THAT CANTILEVERS MAY SERVE MAINLINE TRACK AND PLATFORM TRACK.
3. RIGHT-OF-WAY REQUIRED FOR THE HIGH-SPEED RAIL GUIDEWAY WILL DEPEND UPON CONDITIONS ALONG THE ALIGNMENT, INCLUDING TERRAIN, WHERE CUT/FILL SLOPES, RETAINING STRUCTURES, AND ACCESS ARE REQUIRED.



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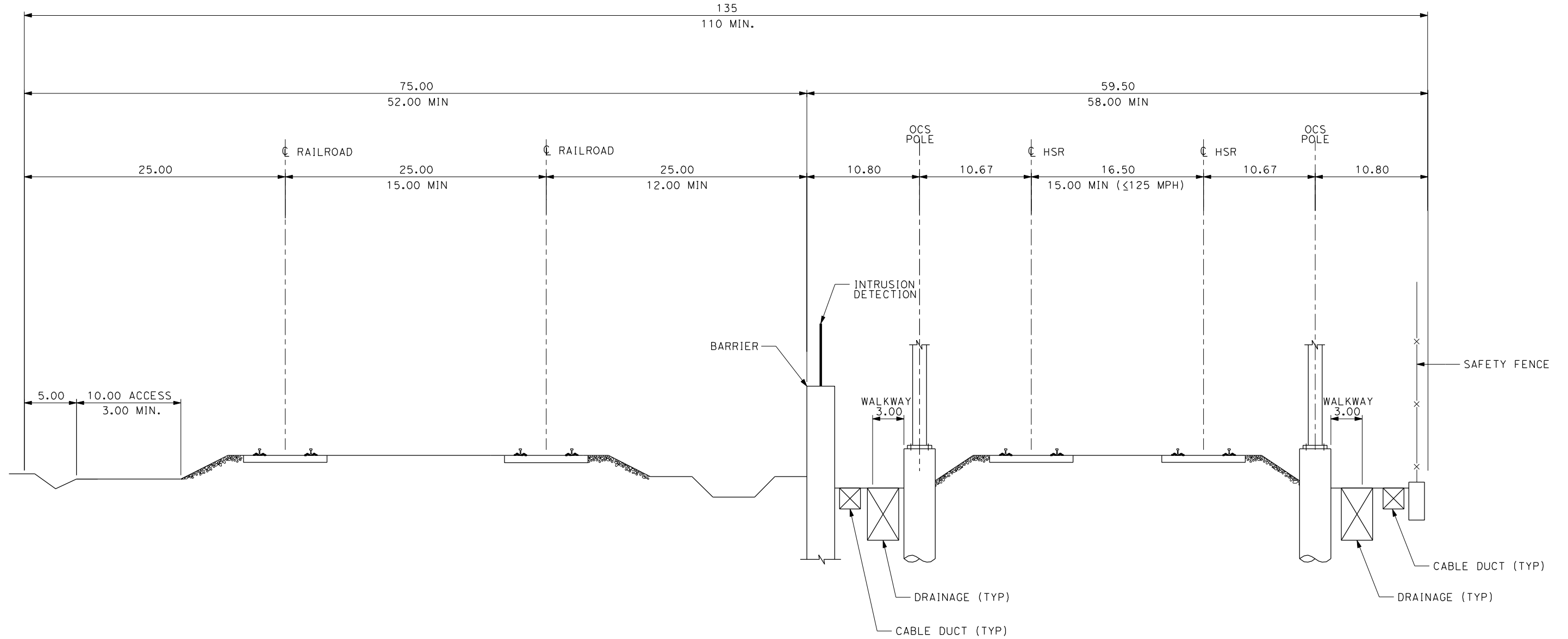
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INTERMEDIATE HSR STATION

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TYPICAL SECTION
HSR IN RAIL - SHARED CORRIDOR

NOTES:

1. TRACK, OCS POLES AND FOUNDATIONS, CABLE DUCTS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
2. DRAINAGE MANHOLES AND OCS FOUNDATIONS ARE OFFSET ALONG TRACK IN PLAN VIEW.
3. RIGHT-OF-WAY REQUIRED FOR THE HIGH-SPEED RAIL GUIDEWAY WILL DEPEND UPON CONDITIONS ALONG THE ALIGNMENT, INCLUDING TERRAIN, WHERE CUT/FILL SLOPES, RETAINING STRUCTURES, AND ACCESS ARE REQUIRED.



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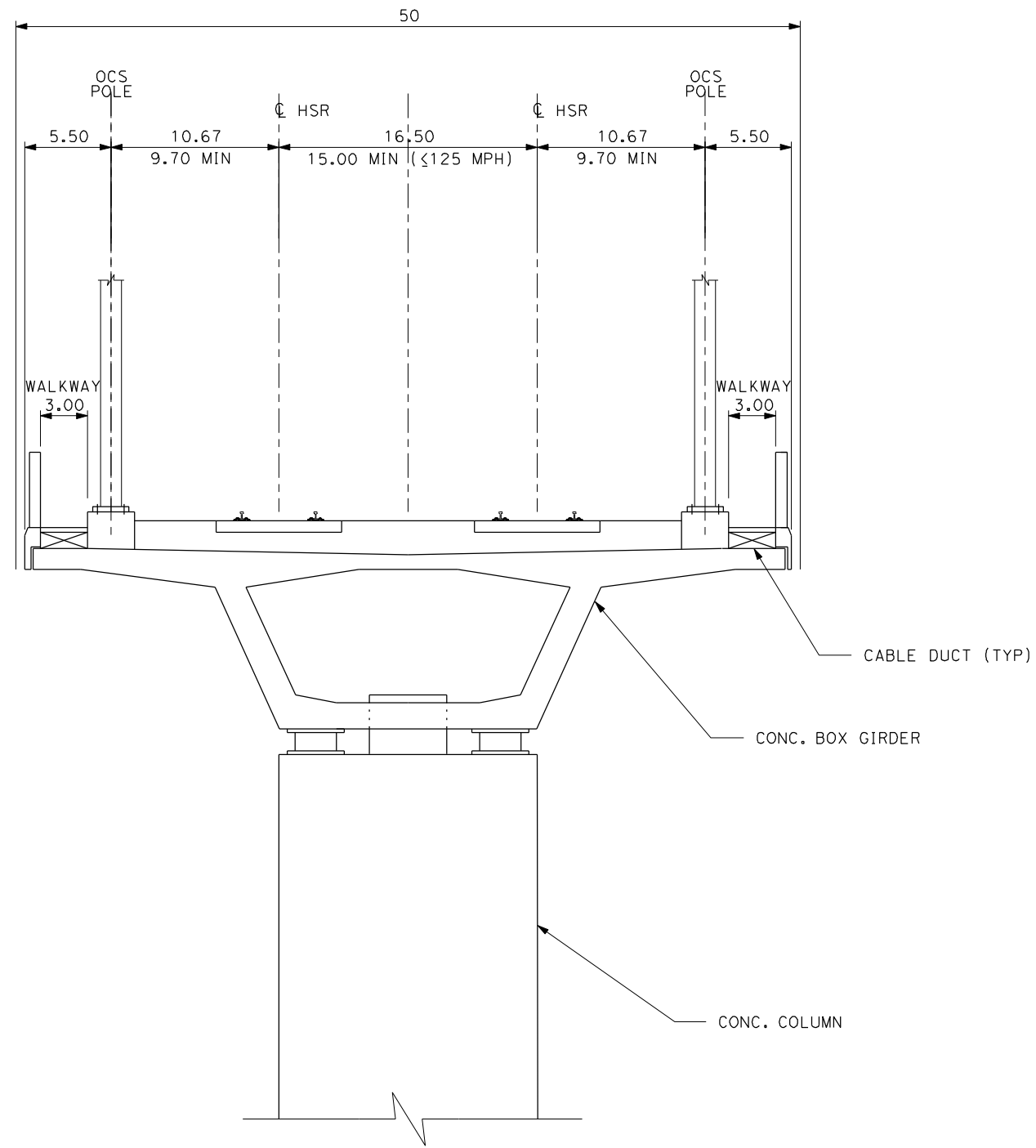
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HSR - SHARED CORRIDOR
AT-GRADE

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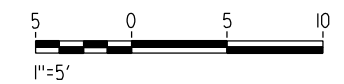
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TYPICAL SECTION
2-TRACK - AERIAL HSR GUIDEWAY

- NOTES:**
1. TRACK, OCS POLES AND FOUNDATIONS, CABLE DUCTS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
 2. RIGHT-OF-WAY REQUIRED FOR THE HIGH-SPEED RAIL GUIDEWAY WILL DEPEND UPON CONDITIONS ALONG THE ALIGNMENT, INCLUDING TERRAIN, WHERE CUT/FILL SLOPES, RETAINING STRUCTURES, AND ACCESS ARE REQUIRED.



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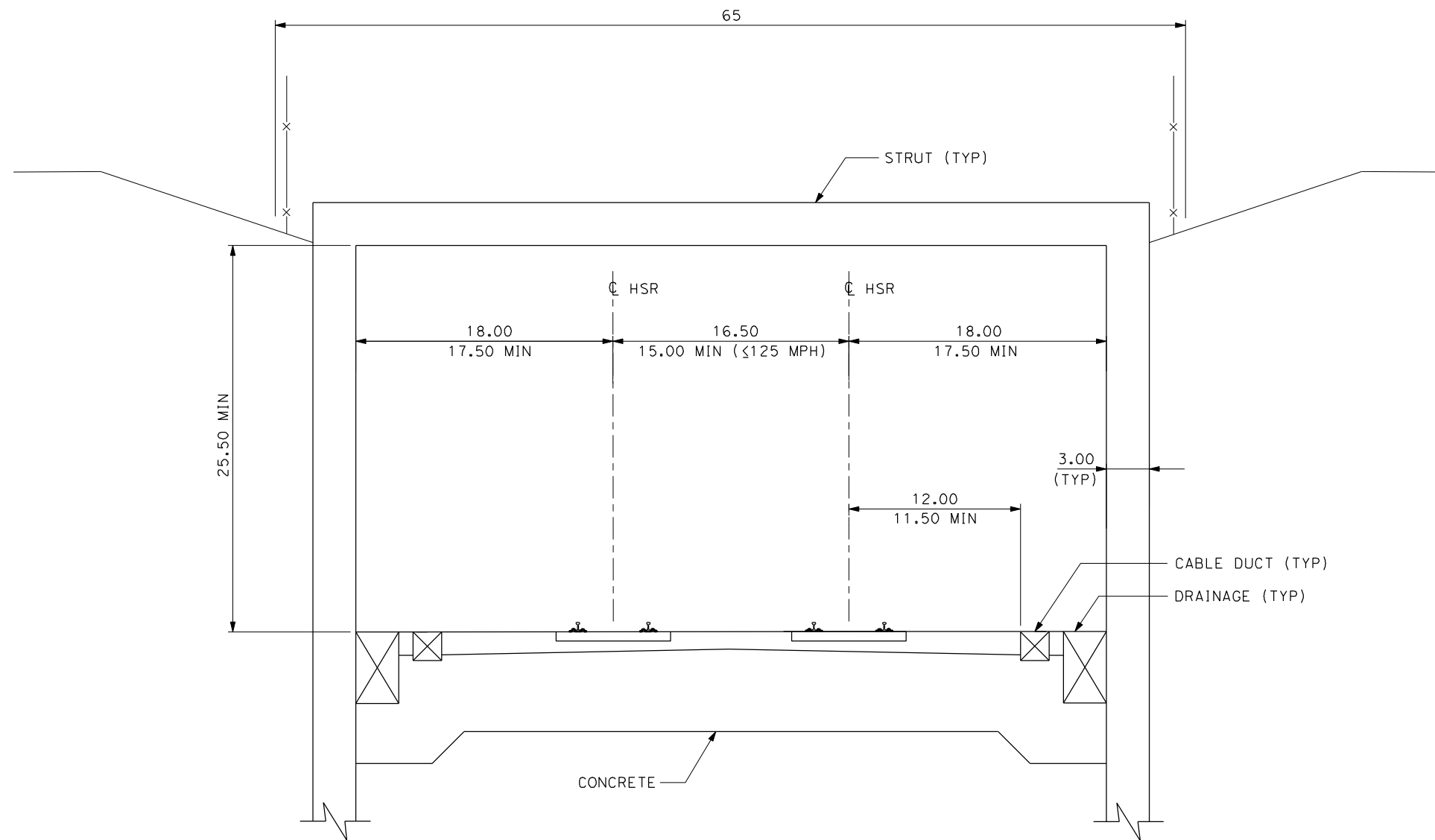


CALIFORNIA HIGH-SPEED TRAIN PROJECT

TWO TRACK - AERIAL HSR GUIDEWAY

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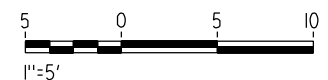
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TYPICAL SECTION
HSR IN TRENCH/RETAINED CUT

NOTES:

1. TRACK, CABLE DUCTS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
2. SYSTEM AND/OR SAFETY NICHE REQUIRED FOR LONG TRENCH GREATER THAN 3000 FT.
3. RIGHT-OF-WAY REQUIRED FOR THE HIGH-SPEED RAIL GUIDEWAY WILL DEPEND UPON CONDITIONS ALONG THE ALIGNMENT, INCLUDING TERRAIN, WHERE CUT/FILL SLOPES, RETAINING STRUCTURES, AND ACCESS ARE REQUIRED.



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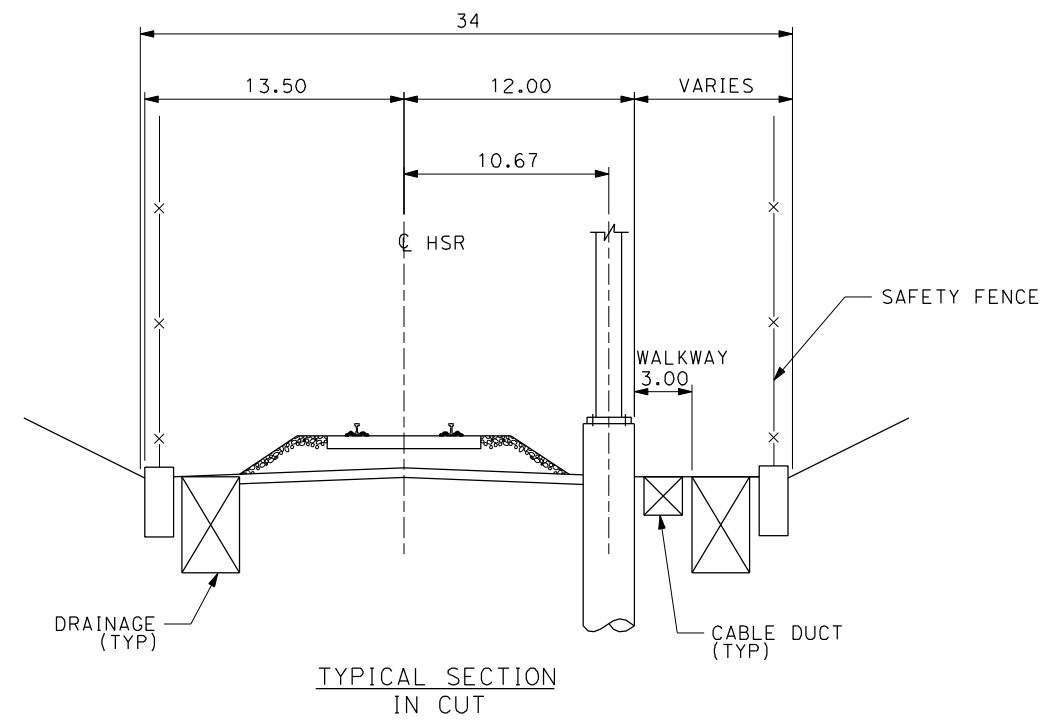
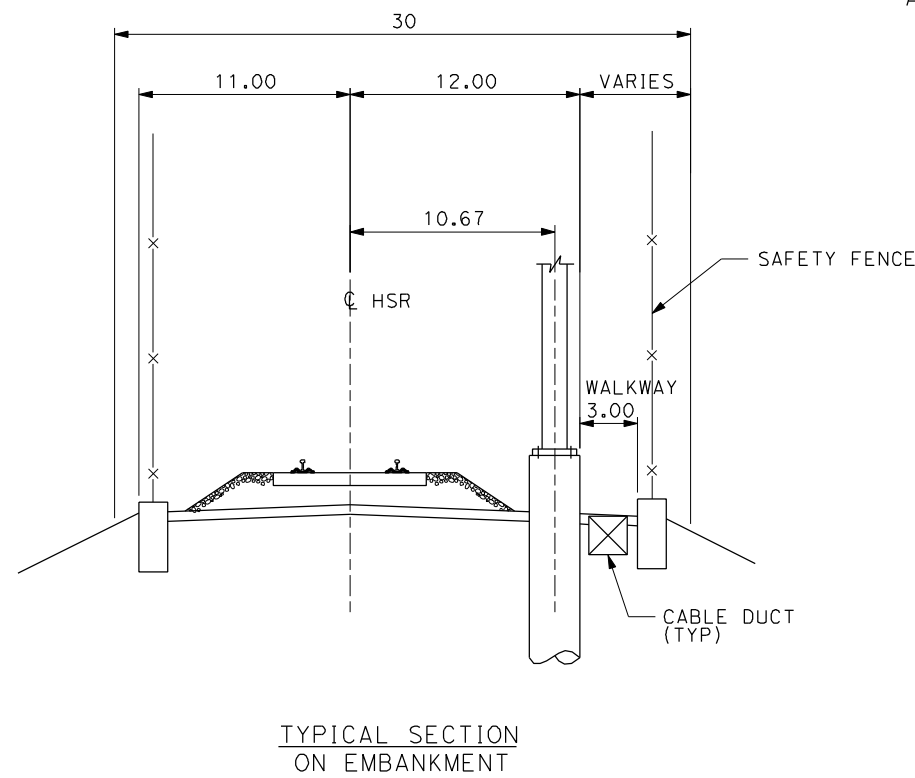
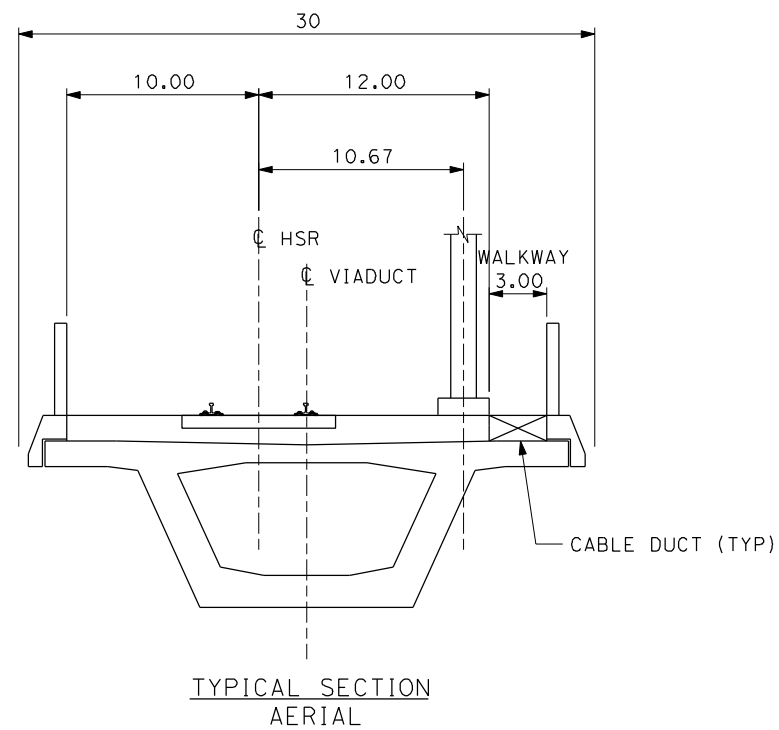
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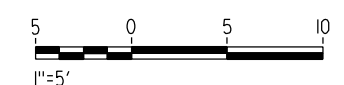
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TWO TRACK HSR IN TRENCH / RETAINED CUT

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- NOTES:**
1. TRACK, OCS POLES AND FOUNDATIONS, CABLE DUCTS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
 2. RIGHT-OF-WAY REQUIRED FOR THE HIGH-SPEED RAIL GUIDEWAY WILL DEPEND UPON CONDITIONS ALONG THE ALIGNMENT, INCLUDING TERRAIN, WHERE CUT/FILL SLOPES, RETAINING STRUCTURES, AND ACCESS ARE REQUIRED.



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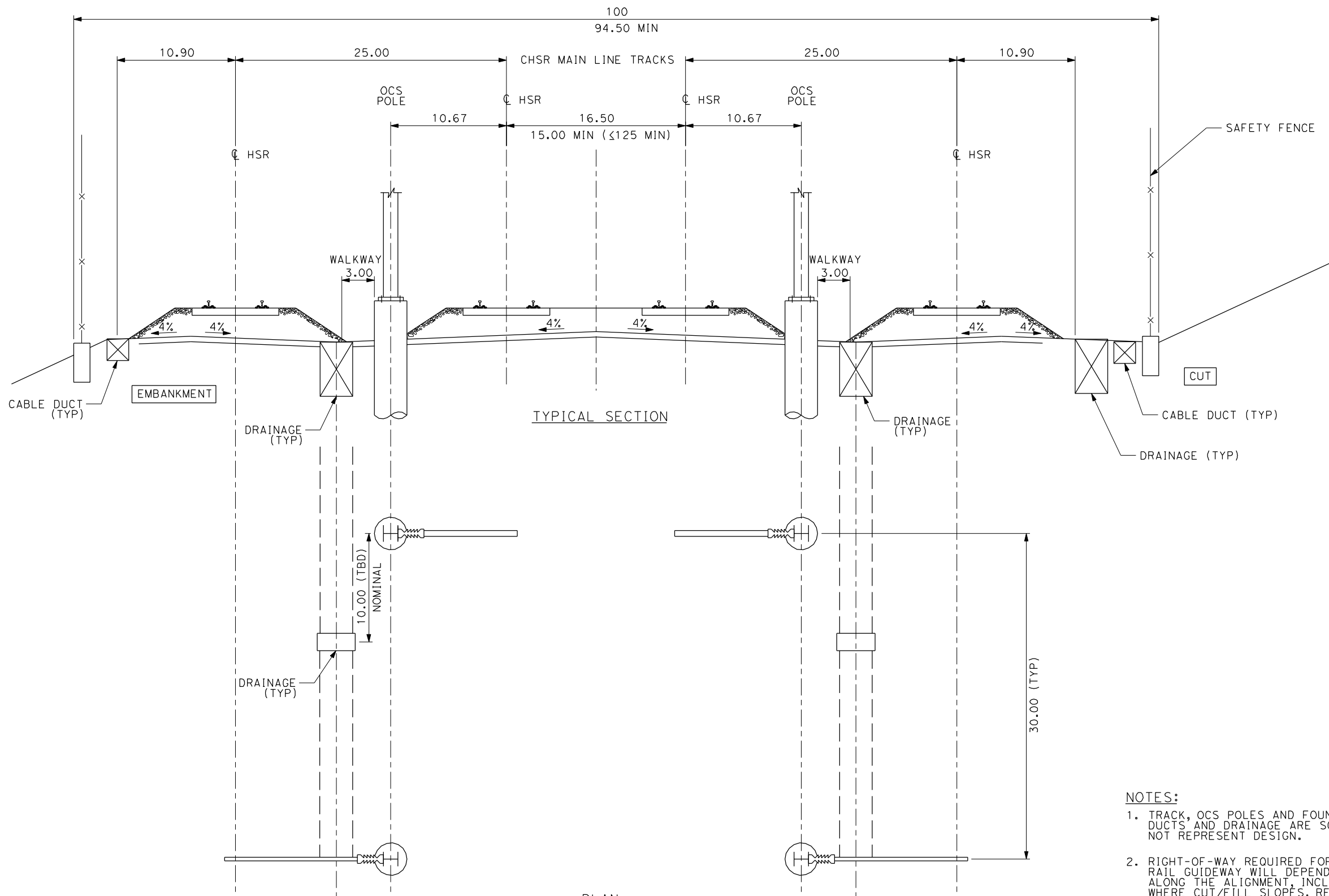
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HSR - SINGLE TRACK FORMATION

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TYPICAL SECTION

PLAN

- NOTES:**
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 2. RIGHT-OF-WAY REQUIRED FOR THE HIGH-SPEED RAIL GUIDEWAY WILL DEPEND UPON CONDITIONS ALONG THE ALIGNMENT, INCLUDING TERRAIN, WHERE CUT/FILL SLOPES, RETAINING STRUCTURES, AND ACCESS ARE REQUIRED.



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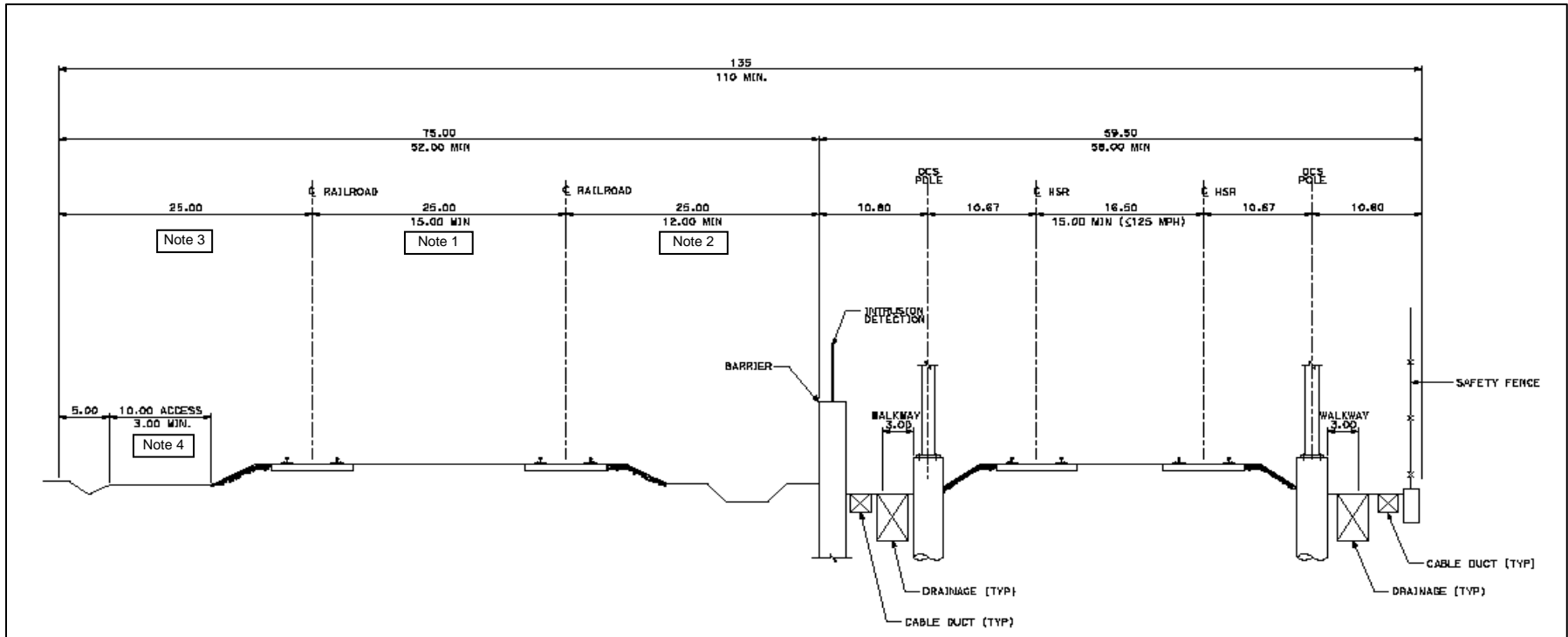


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HSR FOUR TRACK AT GRADE

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APPENDIX B – Supplemental Criteria in Shared Rail Corridor

APPENDIX B
 SUPPLEMENTAL DATA FOR SHARED RAIL CORRIDOR



Note Number	Cross Section Element	Desired / Minimum Distance			
		CPUC	AREMA	Freight RR	Caltrain
1	Track Centers - Mainline Tracks	14' - 0"	14' - 0"	25'-0" (BNSF) 20'-0" (UP)	15'-0" Min.
2	Permanent Structures	8' - 6"	25'-0" / 9'-0"	25' - 0"	25'-0"
3	Distance to ROW	No Indication	No Indication	25' - 0"	No Indication
4	Access Road / Walkway	2'-0"	No Indication	10' (BNSF)	2'-0" Min.
	Minimum Vertical Clearance	22'-6"	23'-0"	23'-4"	24'-6"
	Temp. Horizontal Clearance			15' (BN) / 12' (UP)	
	Temp. Vertical Clearance			21'	