SECTION 34 05 17

COMMON WORK RESULTS FOR TRACKWAY

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. District-furnished materials.

B. Contractor-furnished materials.

C. Construction equipment.

D. Track tools.

E. Track alignment and geometry.

F. Track markers.

G. Thermal rail adjustment.

H. Track tolerances.

I. Contractor geometry inspection.

J. Track inspections.

K. Contract rail insulators.

L. Third rail rust and mill scale removal.

M. Trackway drainage.

1.02 RELATED SECTIONS

A. Section 34 11 23– Special Trackwork

B. Section 34 11 24 – Direct Fixation Track

C. Section 34 11 25 – Running Rail

D. Section 34 11 27 – Ballasted Track

E. Section 34 11 30 – Embedded Track

F. Section 34 11 31 – Concrete Cross Ties

G. Section 34 11 32 – Resilient Ties

H. Section 34 11 37 – Direct Fixation Fasteners

I. Section 34 11 93 – Track Appurtenances and Accessories

1.03 MEASUREMENT AND PAYMENT

A. General: General Track Construction will not be measured separately for payment. All costs in connection therewith will be considered as included in the applicable Contract lump sum price or the Contract unit price per linear foot for trackwork of the different types indicated as listed in the bid item in the Bid Schedule of the Bid Form.

1.04 REFERENCES

A. American Railway Engineering and Maintenance of Way Association (AREMA).

1. AREMA Manual.

B. Association of American Railroads (AAR).

1. AAR Section G, Wheels and Axles.

C. Code of Federal Regulations (CFR).

1. Title 49, Environment, Volume 4, Chapter II, Federal Railroad Administration.

D. State of California, Department of Transportation (Caltrans), Standard Specifications, Section 95, Epoxy.

1.05 SUBMITTALS

A. Refer to Section 01 33 00 - Submittal Procedures, and Section 01 33 23 - Shop Drawings, Product Data, and Samples, for submittal requirements and procedures.

B. Provide additional submittals as required herein.

C. All submittal shall be prepared, reviewed, signed, and sealed by a qualified independent California Registered Professional Engineer, experienced in the design of the item being submitted, engaged by the Contractor.

D. Submit design drawings, material specifications, laboratory test results, and fabrication procedures in sufficient detail to demonstrate conformance or equivalence with the Contract requirements herein.

E. Any requests for deviation from Contract requirements shall be submitted separately and in advance of the submittals required herein.

F. Submittals shall include all approved requests for deviation from the Contract requirements. No unapproved requests for deviation shall be included with the submittal.

G. Submittals for each item shall submitted as a complete package and include all required information. No external references are allowed; all required information shall be included with the submittal.

H. Each submittal shall include a certification, prepared by the qualified independent California Registered Professional Engineer, that information in the submittal meets all applicable Contract requirements.

I. Quality Control Plan: Submit for approval prior to beginning track construction a detailed quality control plan for ballasted, direct fixation (DF), resilient tie, and embedded track and special trackwork that includes all corrective procedures.

J. Construction Equipment Submittals:

1. Submit loading diagrams for all construction equipment and complete calculations, showing conformance with indicated live load requirements for approval before construction equipment will be permitted on ballast deck bridges or aerial structures.

2. Submit construction equipment data for all on-track construction equipment, showing compliance with wheel contour, gage, and clearance requirements.

K. Test Reports: Submit laboratory reports certifying that track gages, levels, and torque wrenches are within specified accuracy tolerances.

L. Track Inspection Reports: Submit two copies of all track inspection reports including charts, continuously covering tracks inspected, at least two weeks prior to any Substantial Completion inspections.

M. Pre-Operations Trackway Inspection Reports: Submit a written copy of all the inspection reports, with a cover sheet clearly defining the areas, tracks, and special trackwork inspected immediately prior to vehicle operations. The cover sheet shall specifically state if the inspected area(s) are safe for vehicle operations.

N. Drainage Systems Video Inspections: Submit videocassettes as specified.

O. Personnel Qualifications: The qualification of the persons(s) performing the pre-operations trackway inspections shall be submitted for approval to the District, at least two weeks in advance of that person(s) performing any inspections.

1.06 QUALITY ASSURANCE

A. Refer to Section 01 43 00 - Quality Assurance, and Section 01 45 00 - Quality Control, for general requirements and procedures.

B. Inspections:

1. All work will be subject to inspection by the Engineer, at the place of manufacture, at the shipping point, and at the shipping destination.

2. Material found to be defective, damaged, or otherwise non-conforming shall be tagged or otherwise marked by the manufacturer and shall be segregated from the material to be provided under the Contract. Such material shall not be repaired or remanufactured without the written approval, in advance, of the Engineer.

3. The Contractor shall be responsible to ensure that all material meets all requirements, as described herein, upon completion of the contract. Any materials damaged during manufacture, shipping, handling, construction, installation, testing and inspection shall be replaced at no additional cost to the District.

C. Except for modifications, amplifications, deletions, and additions indicated herein, construct track in accordance with the requirements of the AREMA Manual.

1.07 QUALIFICATIONS

A. Supervisory Personnel: Track construction shall be performed under the direction of qualified and competent supervisory personnel, including foreman and gang leaders, experienced in track construction.

B. Pre-Operations Trackway Inspections: The person(s) performing the inspection shall meet the requirements provided in the CFR Title 49, Part 214 (FRA Standards), Subpart A, Article 213.7(b). Minimum qualification shall be based upon experience inspecting operational tracks, with the inspection made under traffic.

1.08 GEOMETRIC DATA

A. Layout tracks to the detailed horizontal and vertical alignment data indicated on the line Contract Alignment Drawings and Plan/Profile Drawings.

B. Key alignment data is indicated on the track charts and is for general orientation only.

PART 2 - PRODUCTS

2.01 DISTRICT-FURNISHED MATERIALS

A. Refer to Section 01 64 13 - District-Furnished Materials and Equipment, of the Contract Specifications for description and quantity of District-furnished materials.

2.02 CONTRACTOR-FURNISHED MATERIALS

A. All products, tools, materials, equipment and labor required to complete all aspects of the work shall be furnished by the Contractor including construction equipment and materials to perform the work required to repair and correct track deviations that exceed specified tolerances disclosed by the specified inspections, and subsequent re-inspections.

B. Inspection Devices: The Contractor shall furnish to the District, the following items in the quantities indicated for the District's use in inspecting trackwork. The items shall be provided prior to beginning track construction and shall become the property of the District.

1. Four rail thermometers identical to those to be used by the Contractor, and conforming to AREMA. The rail thermometers shall be identical to those to be used by the Contractor.

2. Four track level/gages, Sola Model SW7182, modified for 5 foot 6 inch track gage, "English" graduations. Track level/gage is a Designated Matching Product.

3. One Sola Platform Clearance Gage, modified for 5 foot 6 inch track gage, "English" graduations. Platform Clearance Gage is a Designated Matching Product.

4. Four 36-inch metal straightedges, two 72-inch metal straightedges.

5. Four taper gages, graduated in thousands of an inch.

6. Two curve paddles with stringline and measuring rule.

7. One spot board.

8. Two torque wrenches of the correct torque range, with the correct size sockets for all nuts and bolts required in the work, and a 9 inch socket extension.

C. Paint for Civil Data: The paint shall be a two-part linear polyurethane applied in accordance with the manufacturer's instructions.

PART 3 - EXECUTION

3.01 CONSTRUCTION EQUIPMENT

A. Contractor's on-track construction equipment shall be designed and constructed to operate within the clearances indicated.

B. The equipment shall be capable of operating on BART's 66 inch gage track.

C. Wheel contours for on-track construction equipment shall conform to AAR standard wheel or AREMA maintenance-of-way work equipment wheels.

D. Single wheel live loads shall not exceed 16,000 pounds uniformly distributed over an area of one square foot applied at any point on BART standard or special aerial structures.

3.02 TRACK TOOLS

A. Except otherwise provided herein, all tools shall conform to AREMA "Specifications and Plans for Track Tools" modified for 5 foot 6 inch track gage.

B. Gages and track levels shall be tested for accuracy by an approved testing laboratory prior to being used for the Work. The Contractor shall submit laboratory reports certifying that the device is accurate to within 1/32" of any measurement.

C. Torque wrenches shall be tested for accuracy by an approved testing laboratory prior to being used for the Work. The Contractor shall submit laboratory reports certifying that Torque wrenches are accurate to within one percent of any measurement.

D. All measuring tools shall be calibrated prior to use and as often as necessary during use to ensure accurate measurements.

3.03 TRACK ALIGNMENT AND GEOMETRY

A. Requirements: Construct trackwork to the horizontal alignment and vertical profile indicated, and within the tolerances specified in Table 1, Table 2 and as provided herein.

B. Profile Rail: The Contractor shall designate right or left rail, while facing in the direction of increasing stationing, to control the elevation of all tangent tracks on a Contract-wide basis. The inside or low rail on curves shall be the profile rail. Top of rail elevations and profile data shall be given for the referenced track. Where another track is parallel or nearly parallel to the referenced track and does not have a profile given, the elevations shall also apply to that track.

Elevation transfer shall be at right angles to the referenced track or, on curves or spirals, radial to the referenced track.

C. Line Rail: The Contractor shall designate right or left rail, while facing in the direction of increasing stationing, to control the alignment of all tangent tracks, and the high or outside rail on horizontal curves as line rail on a Contract-wide basis. The line rail shall be located 2 feet 9 inches, measured horizontally, from the design centerline of track indicated on the alignment drawings included with the Contract Drawings.

3.04 TRACK MARKERS

A. Location Accuracy

1. Track marker locations shall be located and confirmed by a professional land surveyor or civil engineer currently licensed or registered in the State of California.

2. Track markers shall be installed and their locations confirmed prior to any inspections.

3. Track markers shall be maintained by the Contractor, at no additional cost to the District, until all Contract exceptions are repaired.

B. Superelevation Tags

1. Tags shall be 20-gage aluminum sheet with raised embossed numbers 3/4 inch in height.

2. Install at locations for each 1/4 inch increment of superelevation, starting at 0 inches, on all horizontal curves, including those with 0 inch superelevation, except closure curves within turnouts.

3. Install with epoxy adhesive in accordance with Caltrans Standard Specifications Section 95-2.05, approximately 12 inches inside the high rail to read in the direction of increasing stationing.

4. Tags shall be installed as follows:

a. Ballasted track: On the tops of the ties.

b. Direct fixation track: On the second pour concrete, at the same level as the bottom of the direct fixation pad assemblies.

c. Resilient Tie Track: On the tops of resilient ties.

d. Embedded track: Superelevation tags are not required on embedded track.

C. Painting of Civil Data on Rails

1. The following civil data shall be painted on the rail, as provided herein:

a. At all points of change of horizontal and vertical alignment.

b. At all stationing equations.

c. Stationing shall be provided every 100 feet, all even stations.

d. Where conflicts exist between different civil data, the arrows for both shall be shown; all of the lettering and numbering shall be located to one side of the related arrow, without interfering with the adjacent arrow.

e. Where crossing material hides painted data, the data shall be painted as near as possible to the running rail, on the surface of the crossing.

f. Within turnouts, the data shall be shown on the rails for both tracks.

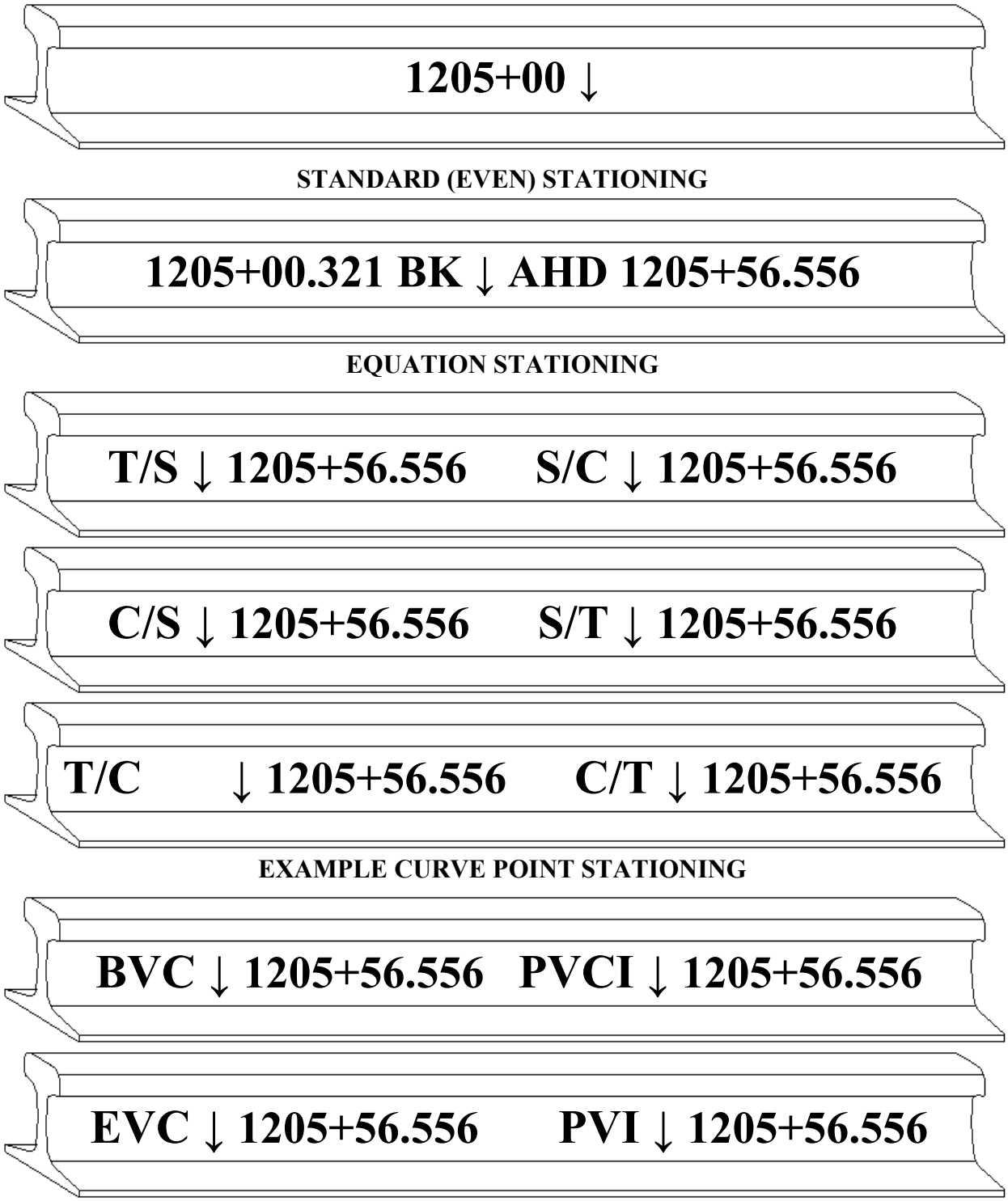
2. Data shall be located on every track on the rail opposite the adjacent walkway. Where no walkway exists, data shall be located on the rail opposite of the adjacent track with the greatest track centers.

3. At locations where the data changes to the opposite rail, it shall be shown on both rails.

4. Prior to painting, oil and grease shall be removed by solvent cleaning, vapor degreasing, or steam cleaning.

5. Stationing and letters as required shall be Romanex Text, white in color, and 3 inches high, on a black background. Letter line width shall be between 3/8 and 1/2 inch. The black background shall be continuous and extend 1/2 inch beyond the edge of all lettering. Refer to Figure 1, herein.

FIGURE 1 - PAINTING OF CIVIL ALIGNMENT DATA ON RAILS



Note: All examples are shown for increasing stationing from left to right, when facing the gage side of the running rail. These shall be reversed when stationing decreases from left to right when facing the gage side of the running rail.

3.05 THERMAL RAIL ADJUSTMENT

A. The final installation of continuously welded rail (CWR) shall provide a uniform neutral rail temperature of plus or minus 5 Fahrenheit degrees of the temperatures provided herein.

B. Adjacent CWR shall provide a uniform neutral rail temperature of plus or minus 5 Fahrenheit degrees of each other.

C. Initial rail temperature shall be determined by means of a standard AREMA rail thermometer. Temperature of rail shall be determined by placing the rail thermometer on the under side and along the centerline of the rail base and left in place until no change in its reading is detected.

D. The neutral rail temperature (t) used shall be as follows:

1. t = 120 degrees Fahrenheit: C Line North of Mile Post 7.8 and A, L and S Lines South of Mile Post 6.0.

2. t = 110 degrees Fahrenheit: R Line and Concord Line South of Mile Post 7.8, Alameda Lines North of Mile Post 6.0 and M Line North of Mile Post 2.8.

3. t = 100 degrees Fahrenheit: M and W Lines South of Mile Post 2.8.

4. t = 80 degrees Fahrenheit: All locations, in subway areas greater than 1000 feet in length and more than 500 feet away from portals.

E. Install a temporary joint to align the rail ends, set the required gap, and support a dutchman rail section to prevent damage to rail ends due to operation of rail mounted track equipment. Use a dutchman if the gap is greater than 1/2 inch.

F. Rail movement shall be exclusively used to determine when rail anchoring is required.

G. The method used to thermally adjust CWR shall not damage any portion of the track or other devices in the trackway.

H. Final adjustment and anchorage of rail shall not be done until the surface and alignment of the track has been placed to within 1/2 inch of design and all ballasting and stabilization have been completed. Surface and alignment found to be more than 1/2 inch of design shall be cut and readjusted after the surface has been repaired.

I. Where connecting to existing tracks the existing rail shall be readjusted for 500 feet, or up to any special trackwork, in both directions from the joint.

J. If for any reason the rail is cut after thermal adjustment is made, or where cutting in to existing track, the rail must be readjusted for 500 feet, or up to any special trackwork, in both directions from the cut. Any incorrect thermal rail adjustment shall be readjusted at no additional cost to the District.

K. Installing CWR on Direct Fixation or Resilient Tie Track: In addition to the other requirements herein, CWR shall be installed on direct fixation or resilient tie track in accordance with the following requirements.

1. Aerial structure CWR shall be installed to be continuous between abutments where the strings are anchored by concrete tie rail fasteners on the adjacent at-grade track.

2. Install CWR on aerial structures and in subways with neither structure nor track subjected to excessive forces imposed by temperature changes or other forces.

3. Anchor CWR on standard aerial structure within the following limitations.

   a. The anchoring of one, two, three, or four rails may advance together if the rail thermal force is uniform within the limits of plus or minus 10 degrees Fahrenheit of the average rail temperature of the track region as specified herein.

   b. If the anchoring operation is interrupted for more than three hours, the operation on each rail shall be staggered at least five girder lengths from the operation on any other rail supported by the same structure.

4. On aerial structures, if the CWR adjustment is by rail stretching, then perform the following operations.

   a. Pull against anchored sections of CWR at least 400 feet long; and

   b. Stagger the anchored sections by at least five girder lengths to minimize the unbalanced loading of piers.

5. The temperature of aerial structures concrete shall be plus or minus 10 degrees of the rails zero thermal stress temperature when the rail is anchored.

6. Maintain a uniformity of forces within the permitted tolerance in the CWR throughout the total length of the aerial structures.

L. Neutral Rail Temperature Verification:

1. At no additional cost to the District, the Contractor shall verify the neutral rail temperature by cutting the rail, releasing rail fasteners, vibrating, readjustment, and re-welding as provided herein.

2. Verification locations will be selected by the Engineer, one per mile on each track.

3. All neutral rail temperature verification shall be performed prior to Substantial Completion.

4. If the rail is found not to be within plus or minus 5 Fahrenheit degrees of that required, the Engineer shall select two additional locations for testing. For each additional location selected by the Engineer found not to be within plus or minus 5 Fahrenheit degrees of that required, two more additional locations may be selected for testing, and so on. Additional testing shall be performed at no cost to the District.

5. As an alternative to cutting the rail, and at no additional cost to the District, the Contractor may use the Vortok “Verse” machine, a non-destructive test method, in lieu of cutting the rail. A qualified person independent of the Contractor shall operate the machine. Vortok shall verify qualification of the person performing the testing, in

writing. The document shall include the qualified person's name. Qualified persons shall maintain a copy of this qualification on their person, ready for inspection by District personnel any time testing is performed. Failure to meet these requirements shall negate the validity of the test.

6. All testing shall be witnessed by the Engineer, the Contractor shall notify the Engineer of any tests and locations at least one week in advance. Simultaneous tests shall not be performed.

M. Fastener Protection:

1. Any damage to the rail fasteners caused by thermal rail adjustment operations shall be repaired or replaced.

2. Skewing, displacement or damages to ties, DF fasteners or resilient ties due thermal rail adjustment operations shall be repaired or replaced.

N. Calculate rail movement and gap between CWR strings by using the following equation:

$$G = [12LK(t-T)]+Q$$

Where	G	=	Rail gap (inches)
	t	=	Zero thermal stress temperature (degrees Fahrenheit)
	T	=	Actual rail temperature at time of laying (degrees Fahrenheit)
	L	=	Length of rail (feet); one-half the sum of lengths of CWR string being laid and the preceding CWR string.
	K	=	Coefficient of thermal expansion for rail steel (0.0000067 inches per foot per degree Fahrenheit)
	Q	=	Rail gap as required by respective manufacturers of field weld kit. For bolted standard joints, Q equals 0 inch, and for field installed insulated rail joints, Q equals the thickness of the end post, for in track electric-flash butt welds Q will be negative.

Note: if the above formula yields a negative value rail shall be added.

3.06 TRACK TOLERANCES

A. Track construction tolerances for the various types of track are shown in Table 1, Track Geometry Tolerances and in Table 2, Other Track Construction Tolerances. If any conflicts exist then the tolerances shown in Table 1 and Table 2 shall be used.

TABLE 1 - TRACK GEOMETRY TOLERANCES

	GAGE DEVIATION		CROSSLEVEL/ SUPER-ELEVATION DEVIATION		PROFILE DEVIATION			HORIZONTAL DEVIATION		
TRACK TYPE	**UNIT[1]**	**TOTAL**	**UNIT[1]**	**TOTAL**	**UNIT[1]**	**Mid ordinate of 62' chord**	**TOTAL**	**UNIT[1]**	**Mid ordinate of 62' chord**	**TOTAL**
Ballasted, Main and Transfer	$^1/_8$" in 31'	$\pm^1/_8$"	$^1/_8$" in 31'	$\pm^1/_8$"	$^1/_8$" in 31'	$\pm^1/_8$"	$\pm^1/_2$"	$^1/_8$" in 31'	$\pm^1/_8$"	$\pm^1/_2$"
Ballasted Yard and Secondary	$^1/_8$" in 31'	$\pm^1/_8$"	$^1/_8$" in 31'	$\pm^1/_8$"	$^1/_8$" in 31'	$\pm^1/_8$"	$\pm^1/_2$"	$^1/_8$" in 31'	$\pm^1/_8$"	±1"
Resilient Ties and Direct Fixation Main and Transfer	$^1/_8$" in 31'	$\pm^1/_8$"	$^1/_8$" in 31'	$\pm^1/_8$"	$^1/_8$" in 31'	$\pm^1/_8$"	$\pm^1/_4$"	$^1/_8$" in 31'	$\pm^1/_8$"	$\pm^1/_4$"
Direct Fixation Yard and Secondary	$^1/_8$" in 31'	$\pm^1/_8$"	$^1/_8$" in 31'	$\pm^1/_8$"	$^1/_8$" in 31'	$\pm^1/_8$"	$\pm^1/_2$"	$^1/_8$" in 31'	$\pm^1/_8$"	$\pm^1/_2$"
All Special Trackwork	$^1/_{16}$" in 31'	$\pm^1/_{16}$"	$^1/_8$" in 31'	$\pm^1/_8$"	$^1/_8$" in 31'	$\pm^1/_8$"	$\pm^1/_4$"	$^1/_8$" in 31'	$\pm^1/_8$"	$\pm^1/_4$"

Notes:
1. Unit Deviation indicates a rate of change.
2. The ends of the chord must be at points on the gage side of the line rail, 5/8" below the top of the railhead.
3. Where conflicts in interpretation arise, the most restrictive deviation shall be used.

TABLE 2 - OTHER TRACK CONSTRUCTION TOLERANCES			
TYPE	**CRITERIA**	**TOLERANCE**	**NOTES**
Open Track	Track Gage	66”±$^{1}/_{8}$”	Distance between gage lines of opposite running rails.
All	Rail Cant	1 in 40 +1 degree, -0 degree	Except as noted on concrete tie and direct fixation special trackwork. Plus indicates inward cant.
Ballasted and Direct Fixation Track	Tie And Fastener Spacing	±1”	Of indicated spacing without accumulation
All	Station Platform Horizontal Alignment	30$^{5}/_{8}$” -$^{1}/_{2}$”, +0”	Distance from Gage Line of the closest running rail to the Top of Platform Edge, measured in a plane parallel to that plane created by the tops of the two running rails
All	Station Platform Vertical Alignment	39” ±$^{1}/_{2}$”	Distance from the plane created by the tops of the two running rails to Top of Platform edge
All	Third Rail Gage	26” ±$^{1}/_{4}$”	Distance from Gage Line of the closest running rail to the centerline the third rail, measured in a plane parallel to that plane created by the tops of the two running rails
All	Third Rail Surface	6$^{1}/_{2}$” ±$^{1}/_{4}$”	Distance from tops of the running rails to the tops of the third rail, measured perpendicular to the plane created by the tops of the two running rails
All	Third Rail Joint Miss-Match	0” ±$^{1}/_{32}$”	Measured using a 36” Straightedge
Ballasted	Overall Width	+2”, -0”	Measured from the centerline of track to edge of shoulder
Ballasted	Shoulder Width	12” +2”, -0”	Along both sides on tangents, the inside of all curves and the outside rail of Curves with radii greater than 2,000 feet.
Ballasted	Shoulder Width	18” +2”, -0”	Along the outside of curves with radii of less than or equal to 2,000 feet.
Ballasted	Shoulder Slope	2:1 +5°, -0°	
Ballasted	Depth Under Tie	12” +6”,-0”	
Ballasted	Top Of Ballast Surface	1” +0, -$^{1}/_{2}$”	Depth below the plane formed by the bottom of the two running rails.
Special Trackwork	Track Gage	66” ±$^{1}/_{16}$”	Distance between gage lines of opposite running rails.
Special Trackwork	Tie And Fastener Spacing	±$^{1}/_{4}$”	Of indicated spacing without accumulation
Special Trackwork	Minimum Switch Rod Clearance (Horizontal)	1”	Minimum distance between switch rod (including bolts) and adjacent ties, plates and fasteners.
Special Trackwork	Minimum Switch Rod Clearance (Vertical)	$^{1}/_{4}$” ±$^{1}/_{8}$”	Distance between top of switch rod and bottom of stock rail.

TABLE 2 - OTHER TRACK CONSTRUCTION TOLERANCES			
TYPE	**CRITERIA**	**TOLERANCE**	**NOTES**
Special Trackwork	Closure Curve Off-Sets And Spreads At Heels Of Frogs	$\pm^{1}/_{16}$”	As measured from the gage lines of the running rails. Unit deviation of no more than $^{1}/_{8}$” in 31’
Special Trackwork	Guard Rail Location	±1”	In reference to the point of frog
Special Trackwork	Switch Point Stagger	$\pm^{1}/_{4}$”	
Special Trackwork	Point Of Switch Location	±1”	Of design Engineering station
Special Trackwork	Turnout Lead Length	±1”	Distance between point of Switch and ½” Point of Frog
Special Trackwork	Switch Point Throw At Each Switch Rod	$\pm^{1}/_{16}$”	Gap distance between gage line of stock rail and backside of switch point, measure with the point open.
Special Trackwork	Stock Rail to Stock Rail Gage	$\pm^{1}/_{16}$”	Distance between gage lines of adjacent stock rails.
Special Trackwork	Guard And Restraining Rail Check Gage	$64^{1}/_{8}$” $\pm^{1}/_{16}$”	Distance between guarding face of guard or restraining rail and gage line of opposite running rail.
Special Trackwork	Guard Rail Face Gage	$62^{1}/_{4}$” $\pm^{1}/_{16}$”	Distance between guarding faces through guard rails opposite frogs.
Special Trackwork	Guard Rail And Restraining Rail Flangeway Width	$1^{7}/_{8}$” $\pm^{1}/_{16}$”	

3.07 CONTRACTOR GEOMETRY INSPECTION

A. The Contractor shall employ a professional land surveyor or civil engineer currently licensed or registered in the State of California to make a survey of the track to determine if the horizontal and vertical alignment, gage, crosslevel, and superelevation are within the tolerances specified for each type of track construction.

B. Prior to Substantial Completion, the Contractor shall also make a complete inspection of the track using a rail mounted geometry inspection vehicle approved by the Engineer. Geometry measurements shall conform to the tolerances provided herein.

C. All deviations, which exceed tolerances, shall be repaired by the Contractor at no additional expense to the District prior to Substantial Completion.

D. If deviations that exceed tolerances are found, additional repairs and geometry measurements shall be made until all tracks are within required tolerances.

E. The track geometry vehicle shall record the following measurements in a single pass.

1. Track gage.

2. Right rail surface (profile).

3. Left rail surface (profile).

4. Right rail alignment.

5. Left rail alignment.

6. Superelevation.

F. Measured Results:

1. All measurements shall be displayed on the same chart, in a linear format, for a length of track, 5000 feet to 6000 feet per page. Charts shall be calibrated and plotted in construction survey stationing.

2. Each measure shall be shown on a separate line with graduations at 0.25 in/div for all measurements except gage, which shall be shown at 0.12 in/div.

G. Ballast shall be inspected by the Contractor prior to the geometry inspections and re-inspections. Locations which show contaminants shall be re-tested as provided herein. If ballast fails any testing, the ballast shall be replaced at no additional cost to the District.

H. Rust and mill scale shall be removed from the third rail and the running rail shall be ground prior to any track geometry measuring or testing. Refer to Article entitled “Third Rail Rust and Mill Scale Removal” herein for detailed requirements.

3.08 FINAL TRACK INSPECTIONS

A. The Contractor shall ensure that the track is free of all substandard conditions prior to Substantial Completion inspections. Substandard conditions found by the Engineer during Substantial Completion inspections, shall delay Substantial Completion, until the track is again inspected by the Engineer and found free of substandard conditions.

B. The final horizontal and vertical alignment, gage, crosslevel, superelevation, third rail surface, and third rail gage shall be within the tolerances specified. In order to determine the acceptability of the finished track, the Engineer will perform a final inspection to establish that the track construction is within the tolerances specified herein. The Contractor shall provide 30 days advance notice of the track’s readiness for finial inspection.

C. In addition to that required herein, tracks may be tested by the District's track geometry test car which is capable of testing gage, crosslevel, left and right rail profiles, track alignment, twist, warp, superelevation, left and right third rail gage and surface. The test car will measure the parameters specified above with sufficient accuracy to establish that the track construction is within the specified tolerances.

D. Unrestricted rail to rail access from the District’s existing operating system to the track to be tested by the District’s Track Geometry test car shall be provided by the Contractor, for the purpose of inspection and re-inspection, at no additional cost to the District.

E. Unobstructed and continuous access to the tracks to be tested shall be provided by the Contractor at no additional cost to the District.

F. The Contractor shall correct track deviations that exceed specified tolerances as disclosed by the above specified inspections, and subsequent re-inspections, at no additional cost to the District.

G. The District will perform necessary re-inspections to ascertain that the corrections have been made. Re-inspections will include the use of the District's track geometry test car. The Contractor shall provide 30 days advance notice of the tracks readiness for re-inspection. Notification of re-inspection shall not be made until after all repairs have been completed.

H. The Contractor shall reimburse the District the full costs incurred by the District for re-inspections by the District's track geometry test car.

3.09 PRE-OPERATION TRACKWAY INSPECTIONS

A. After the completion of any work performed and prior to the operation of test trains or cars that are regularly used for BART revenue service , an inspection shall be made of the trackway by the Contractor.

1. When operations extend more than 24 hours, the inspections shall be made at a minimum, at least daily, more often if required.

2. Inspections shall not be made more than 4 hours prior to the operation of vehicles.

3. If any work is performed in the trackway after an inspection, the trackway shall be reinspected after the work is complete prior to vehicle operation.

B. Persons performing pre-operations trackway inspections shall meet the qualifications specified in the Article entitled “Qualifications” herein.

C. The inspection shall ensure that all trackways subject to the operation are safe for vehicle operations.

D. In addition to the track, the inspection shall include the third rail assembly and right of way securement and shall ensure that sufficient clearances exist for vehicle operation.

E. The Contractor shall repair any unsafe conditions found during the inspection.

F. The Engineer may make additional inspections and shall have final authority for determining if the trackway is fit for the operation of vehicles.

G. The inspection reports shall meet the requirements found in the FRA Standards, Subpart E, Article 213.241 and shall include the time the inspection was started and completed.

H. Refer to requirements for inspection reports under “Submittals”. Records of these inspections shall be maintained by the Contractor for one year, original inspection reports shall be made available to the District upon request.

I. These inspections shall be performed and all defective conditions found repaired at no additional cost to the District.

3.10 CONTACT RAIL INSULATORS

A. Contact rail brackets, insulators, contact rail and coverboard, shall not be installed until final completion of trackwork, including all rail welding, final surfacing, alignment, ballast compaction and regulation.

3.11 THIRD RAIL RUST AND MILL SCALE REMOVAL

A. After installation and prior to any inspections, the Contractor shall remove all rust and mill scale from the wearing surface the third rail. Rust and mill scale may be removed by performing sand/bead blasting or power wire brushing. Grinding shall not be used.

B. The Contractor shall maintain these surfaces free of rust and mill scale.

C. The Contractor shall protect the track from debris; ballast shall not be fouled.

3.12 TRACKWAY DRAINAGE

A. The Contractor shall protect, maintain, and clean all trackway drainage systems, including direct fixation and resilient tie trackwork inverts, throughout the construction and testing phase, at no additional cost to the District.

B. The Contractor shall maintain drainage systems free of debris, free flowing at their intended capacity and without damming or ponding of water.

C. Trackway Drainage Video Inspection: The Contractor shall have a complete video inspection of all drainage systems performed and submit these to the Engineer no earlier than two weeks prior to Substantial Completion and again no earlier than two weeks prior to District possession.

1. The inspection shall be performed by a qualified independent testing laboratory approved by the Engineer in advance of inspection.

2. The submitted data shall clearly designate the location of the areas inspected and shall include a drawing cross-referencing the various drainage system inspected and submitted video inspections.

3. The inspections shall be submitted in standard format on VHS videocassettes; other formats may be used with prior written approval of the Engineer.

D. The Engineer may, at its discretion, require additional inspections of drainage systems suspected to be fouled.

END OF SECTION 34 05 17