

NOTES:

GENERAL NOTES

- STANDARD DRAWINGS ARE TO BE READ IN CONJUNCTION WITH GO TRANSIT'S "SUPPLY OF CONCRETE TIES" SPECIFICATION.
- MANUFACTURER SHALL SUBMIT SHOP DRAWINGS INCLUDING ALL INFORMATION NECESSARY FOR FABRICATION AND HANDLING. THIS SHALL INCLUDE, BUT NOT BE LIMITED TO, PLAN, ELEVATION AND CROSS SECTIONS WITH REINFORCING WIRES, RAIL FASTENER ASSEMBLIES, AND EMBEDDED ITEMS. SHOW DIMENSIONS, WEIGHT, DETAILS, TOLERANCES, SURFACE FINISHES, CONCRETE STRENGTH AND MATERIAL SPECIFICATIONS AS APPLICABLE.

TIE

- THE TIE ILLUSTRATED HERE IS INDICATIVE ONLY. THE MANUFACTURER SHALL DESIGN AND MANUFACTURE THE CONCRETE TIE IN ACCORDANCE WITH GO TRANSIT'S "SUPPLY OF CONCRETE TIES" SPECIFICATION, AREMA, CHAPTER 30, PART 4, AND FOR THE FOLLOWING SERVICE LOADS AND TRACK CONDITIONS:
 - AXLE LOADS: 30 TONNES (METRIC)
 - ANNUAL TONNAGE: MIN 20 MILLION GROSS TONNES (METRIC)
 - TIE SPACING: 24" (610mm)
 - MAXIMUM SPEED: 100 MPH (160 KPH)
- THE TIE SHALL BE SYMMETRICAL AT THE CENTRELINE OF TIE.
- STANDARD TRACK GAUGE IS 4' 8-1/2" (1,435mm).
- THE RAIL SEAT SHALL BE CANTED 1:40 TOWARDS THE CENTRELINE OF TIE.
- THE RAIL SEAT SHALL BE A FLAT SMOOTH SURFACE AND PLANE TO A TOLERANCE OF ± 1/32" (8mm).
- PREFERRED TIE DIMENSIONS ARE:
 - LENGTH: 8'3" (2,515mm)
 - BASE WIDTH: 10-1/2" (265mm)
 - HEIGHT AT RAIL SEAT: 8" (203mm)
- PREFERRED TIE WEIGHT: 610 - 650 LB (277 - 295 KG).
- PRESTRESSING WIRES ARE NOT SHOWN, TO BE DESIGNED AND MANUFACTURED IN ACCORDANCE WITH AREMA, CHAPTER 30, SECTION 4.2 AND ASTM A881.
- PRESTRESSING WIRES SHALL BE PRETENSIONED.
- PRESTRESSING WIRES SHALL NOT PROTRUDE MORE THAN 1/8" (3mm) BEYOND THE CONCRETE SURFACE OF THE END OF THE TIE.
- SCALLOP DESIGN SHOWN IS INDICATIVE ONLY. MANUFACTURER MAY MAKE VARIATION(S) WITHOUT REDUCING THE FUNCTIONALITY OF THE SCALLOPS.
- THE MANUFACTURER SHALL DESIGN AND SUPPLY CONVERGENCE SETS OF CONCRETE TIES TO ALLOW THE CONVERGENCE OF THE GUARDRAIL BEYOND THE PROTECTED AREA.

RAIL FASTENINGS

- CLIP: PANDROL e2009L, OR APPROVED EQUIVALENT
- PAD: PANDROL 16146 (FOR 5.5" RAIL BASE), OR APPROVED EQUIVALENT
- INSULATOR: PANDROL HD8, OR APPROVED EQUIVALENT
- SHOULDER: PANDROL 13294, OR APPROVED EQUIVALENT

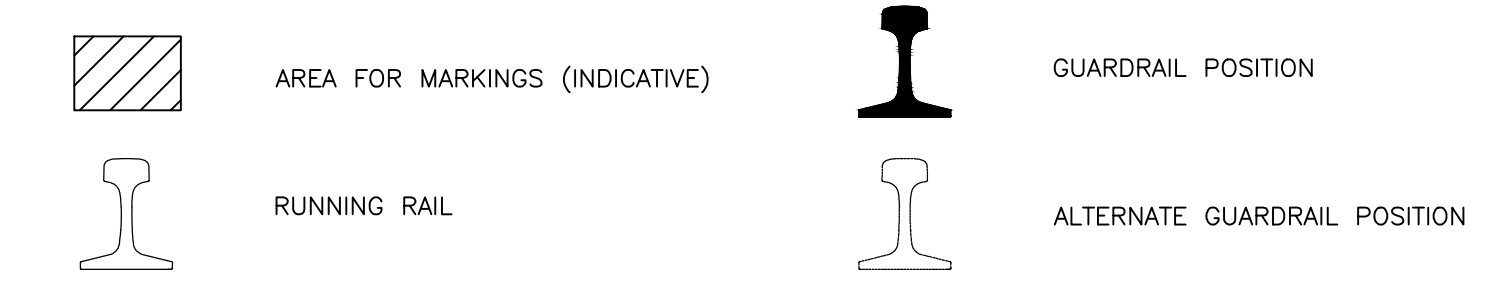
GUARDRAIL FASTENINGS

- INSERT: 7/8" UNC THREAD, SHALL BE COMPATIBLE WITH CLIP AS PER GO TS PLAN GTS-1334
- BOLT: 7/8" UNC THREAD, SHALL BE COMPATIBLE WITH CLIP AS PER GO TS PLAN GTS-1334
- WASHER: SHALL BE COMPATIBLE WITH CLIP AS PER GO TS PLAN GTS-1334
- CLIP: SHALL BE COMPATIBLE WITH GO TS PLAN GTS-1334
- CAP PLUG: SHALL BE COMPATIBLE WITH CLIP AS PER GO TS PLAN GTS-1334

CONCRETE

- MINIMUM 28-DAY COMPRESSIVE STRENGTH: 7,000 PSI (48MPA).
- MINIMUM TRANSFER REQUIREMENTS: 4,500 PSI (31MPA).
- MINIMUM AIR VOID CONTENT OF 3.5% IN THE HARDENED CONCRETE.
- CEMENT SHALL BE PORTLAND CEMENT, MEETING ASTM C150, WITH LESS THAN 0.60% ALKALI CONTENT.
- AGGREGATES SHALL MEET ASTM C33, WITH MAXIMUM AGGREGATE SIZE OF 3/4" (20mm).
- THE CHOICE OF CONCRETE MATERIALS, MIX DESIGN, MANUFACTURING PROCESS SHALL ALL AIM TO MINIMIZE CRACKING AND DETERIORATION ASSOCIATED WITH DELAYED ETTRINGITE FORMATION (DEF), ALKALI AGGREGATE REACTIVITY (AAR) AIR-ENTRAINMENT, OTHER ADMIXTURES, SULPHATE REACTIONS, ALKALI-SILICA REACTIVITY (ASR) AND DE-ICING CHEMICALS (CHLORIDES) IN ACCORDANCE WITH CSA-A23.1, CSA-A23.4 AND INDUSTRY STANDARDS.
- CONCRETE SHALL ACCOMMODATE CLASS OF EXPOSURE C-1, IN ACCORDANCE WITH CSA-A23.1-09.

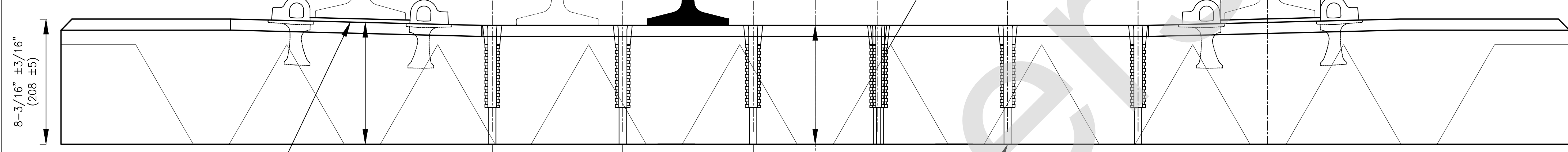
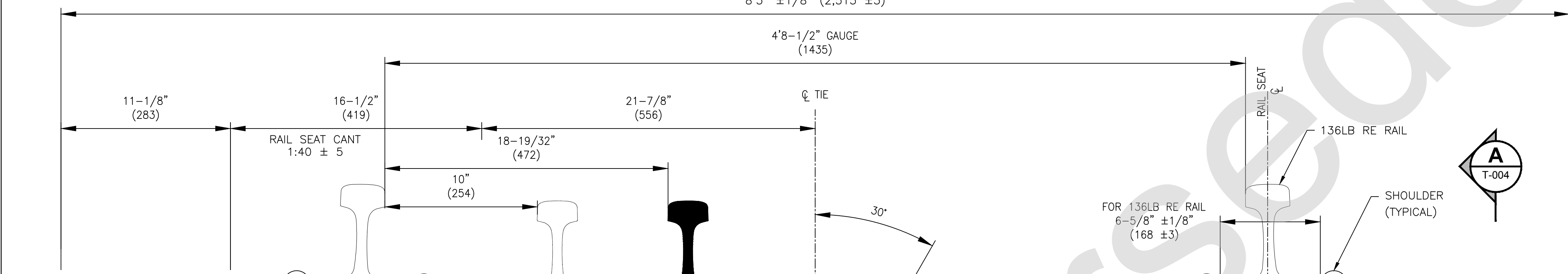
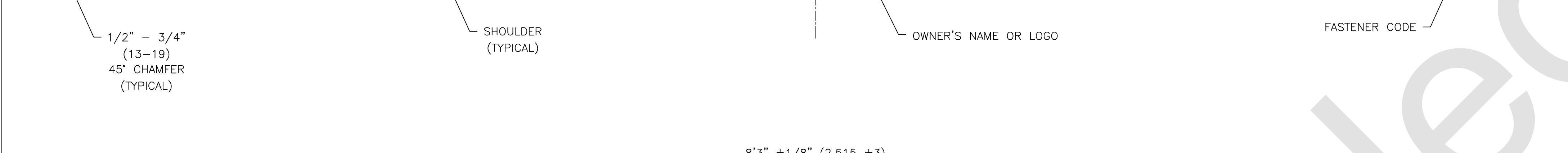
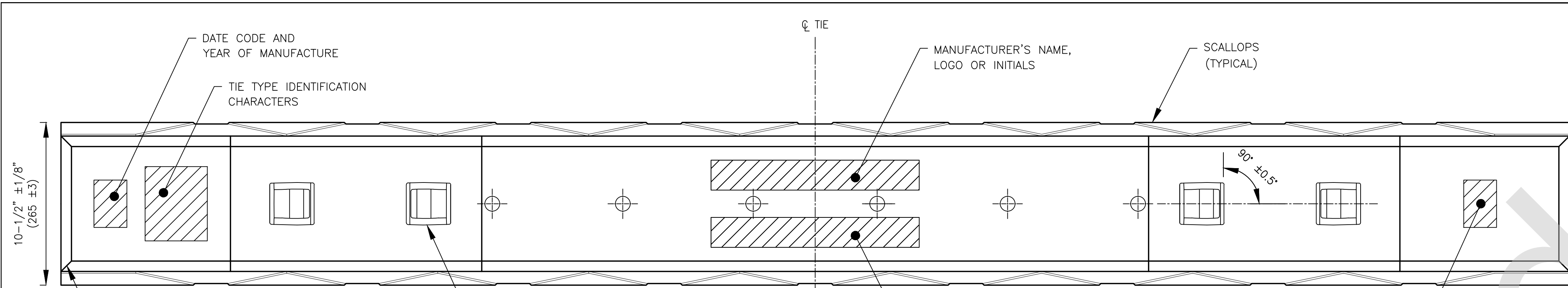
LEGEND



ALL DIMENSIONS SHOWN ARE IN INCHES AND/OR MILLIMETRES.

METRIC CONVERSION: 1 inch=25.4mm, 1 foot=304.8mm

1	18/07/27	ADDED IMPERIAL TO METRIC CONVERSION NOTE	
No.	Date	Revision	By Approved
Standard		CONCRETE GUARDRAIL TIE STANDARD DRAWING 115LB. R.E. RUNNING RAIL	
Drawn	MG	Checked	GGG
Approved	VP Engineering & Asset Management		
Date	DEC 15, 2017	Plan Number	GTS-2007 Rev 1
REFERENCE: TS-2007-R3		Sheet 1 OF 2	



NOTES:

GENERAL NOTES

- STANDARD DRAWINGS ARE TO BE READ IN CONJUNCTION WITH GO TRANSIT'S "SUPPLY OF CONCRETE TIES" SPECIFICATION.
- MANUFACTURER SHALL SUBMIT SHOP DRAWINGS INCLUDING ALL INFORMATION NECESSARY FOR FABRICATION AND HANDLING. THIS SHALL INCLUDE, BUT NOT BE LIMITED TO, PLAN, ELEVATION AND CROSS SECTIONS WITH REINFORCING WIRES, RAIL FASTENER ASSEMBLIES, AND EMBEDDED ITEMS. SHOW DIMENSIONS, WEIGHT, DETAILS, TOLERANCES, SURFACE FINISHES, CONCRETE STRENGTH AND MATERIAL SPECIFICATIONS AS APPLICABLE.

TIE

- THE TIE ILLUSTRATED HERE IS INDICATIVE ONLY. THE MANUFACTURER SHALL DESIGN AND MANUFACTURE THE CONCRETE TIE IN ACCORDANCE WITH GO TRANSIT'S "SUPPLY OF CONCRETE TIES" SPECIFICATION, AREMA, CHAPTER 30, PART 4, AND FOR THE FOLLOWING SERVICE LOADS AND TRACK CONDITIONS:
 - AXLE LOADS: 30 TONNES (METRIC)
 - ANNUAL TONNAGE: MIN 20 MILLION GROSS TONNES (METRIC)
 - TIE SPACING: 24" (610mm)
 - MAXIMUM SPEED: 100 MPH (160 KPH)
- THE TIE SHALL BE SYMMETRICAL AT THE CENTRELINE OF TIE.
- STANDARD TRACK GAUGE IS 4' 8-1/2" (1,435mm).
- THE RAIL SEAT SHALL BE CANTED 1:40 TOWARDS THE CENTRELINE OF TIE.
- THE RAIL SEAT SHALL BE A FLAT SMOOTH SURFACE AND PLANE TO A TOLERANCE OF ±1/32" (8mm).
- PREFERRED TIE DIMENSIONS ARE:
 - LENGTH: 8'3" (2,515mm)
 - BASE WIDTH: 10-1/2" (265mm)
 - HEIGHT AT RAIL SEAT: 8" (203mm)
- PREFERRED TIE WEIGHT: 610 - 650 LB (277 - 295 KG).
- PRESTRESSING WIRES ARE NOT SHOWN, TO BE DESIGNED AND MANUFACTURED IN ACCORDANCE WITH AREMA, CHAPTER 30, SECTION 4.2 AND ASTM A881.
- PRESTRESSING WIRES SHALL BE PRETENSIONED.
- PRESTRESSING WIRES SHALL NOT PROTRUDE MORE THAN 1/8" (3mm) BEYOND THE CONCRETE SURFACE OF THE END OF THE TIE.
- SCALLOP DESIGN SHOWN IS INDICATIVE ONLY. MANUFACTURER MAY MAKE VARIATION(S) WITHOUT REDUCING THE FUNCTIONALITY OF THE SCALLOPS.
- THE MANUFACTURER SHALL DESIGN AND SUPPLY CONVERGENCE SETS OF CONCRETE TIES TO ALLOW THE CONVERGENCE OF THE GUARDRAIL BEYOND THE PROTECTED AREA.

RAIL FASTENINGS

- CLIP: PANDROL e2009L, OR APPROVED EQUIVALENT
- PAD: PANDROL 37693 (FOR 6.0" RAIL BASE), OR APPROVED EQUIVALENT
- INSULATOR: PANDROL HD8, OR APPROVED EQUIVALENT
- SHOULDER: PANDROL 13294, OR APPROVED EQUIVALENT

GUARDRAIL FASTENINGS

- INSERT: 7/8" UNC THREAD, SHALL BE COMPATIBLE WITH CLIP AS PER GO TS PLAN GTS-1334
- BOLT: 7/8" UNC THREAD, SHALL BE COMPATIBLE WITH CLIP AS PER GO TS PLAN GTS-1334
- WASHER: SHALL BE COMPATIBLE WITH CLIP AS PER GO TS PLAN GTS-1334
- CLIP: SHALL BE COMPATIBLE WITH GO TS PLAN GTS-1334
- CAP PLUG: SHALL BE COMPATIBLE WITH CLIP AS PER GO TS PLAN GTS-1334

CONCRETE

- MINIMUM 28-DAY COMPRESSIVE STRENGTH: 7,000 PSI (48MPA).
- MINIMUM TRANSFER REQUIREMENTS: 4,500 PSI (31MPA).
- MINIMUM AIR VOID CONTENT OF 3.5% IN THE HARDENED CONCRETE.
- CEMENT SHALL BE PORTLAND CEMENT, MEETING ASTM C150, WITH LESS THAN 0.60% ALKALI CONTENT.
- AGGREGATES SHALL MEET ASTM C33, WITH MAXIMUM AGGREGATE SIZE OF 3/4" (20mm).
- THE CHOICE OF CONCRETE MATERIALS, MIX DESIGN, MANUFACTURING PROCESS SHALL ALL AIM TO MINIMIZE CRACKING AND DETERIORATION ASSOCIATED WITH DELAYED ETTRINGITE FORMATION (DEF), ALKALI AGGREGATE REACTIVITY (AAR) AIR-ENTRAINMENT, OTHER ADMIXTURES, SULPHATE REACTIONS, ALKALI-SILICA REACTIVITY (ASR) AND DE-ICING CHEMICALS (CHLORIDES) IN ACCORDANCE WITH CSA-A23.1, CSA-A23.4 AND INDUSTRY STANDARDS.
- CONCRETE SHALL ACCOMMODATE CLASS OF EXPOSURE C-1, IN ACCORDANCE WITH CSA-A23.1-09.

LEGEND

AREA FOR MARKINGS (INDICATIVE)

GUARDRAIL POSITION

ALTERNATE GUARDRAIL POSITION

RUNNING RAIL

METRIC CONVERSION: 1 inch=25.4mm, 1 foot=304.8mm

No.	Date	Revision	By	Approved
1	18/07/27	ADDED IMPERIAL TO METRIC CONVERSION NOTE		

Standard / CONCRETE GUARDRAIL TIE STANDARD DRAWING 136LB. R.E. RUNNING RAIL

Drawn MG Checked GGS Approved [Signature] VP Engineering & Asset Management

Date DEC 15, 2017 Plan Number GTS-2007 Rev 1

REFERENCE: TS-2007-R3 Sheet 2 OF 2