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Chapter 2
Transportation

Design Specifications & Requirements Manual

October 2003

Updated January 2025

City of London
Design Specifications and Requirements Manual

The design information contained in this manual is intended to provide guidance beyond legislative and standard design practices for use in the City of London (the City). There will be site specific situations where the design will depart from these practices as it is not possible nor is it the intention of the City to anticipate every situation. The City intends to review and revise the Manual from time to time. The City also acknowledges that other references such as the 'Standard Contract Documents for Municipal Construction Projects' are to be used in conjunction with this manual. The 2012 update of this manual incorporates design information from the City's former 'Subdivision & Development Guide Manual' to provide consistent and current design information for development projects.

The City of London maintains its right to accept or refuse any design submissions and requires an acceptable design for any given circumstance.

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2.1. Roads Design

2.1.1. Complete Streets Design

City of London's streets are to be designed with a complete streets approach. A complete streets approach is about considering the needs of pedestrians, cyclists, transit riders, motorists, and ecology and constructing streets that balance these needs.

The traditional road design philosophy of the past prioritized vehicle movement over other more active or sustainable modes of transportation and green infrastructure. This has resulted in a significant portion of roads within the City of London that are both unsupportive of active and sustainable modes of transportation and also lack the green infrastructure that should support the ecological and hydrological systems in the city. Since adoption of the complete streets approach, the City is now using street design as an opportunity to introduce infrastructure that more equitably supports pedestrians, cyclists, transit riders, and green infrastructure.

2.1.2. Design Speed

Design speed shall be based on the following chart:

Posted Speed (km/h)	Design Speed (km/h)
40	40
50	50
60	60
70	80
80	90
90	110
100	120

Design speed for Neighbourhood Connectors shall be 50km/h unless adjacent to schools or high pedestrian generators such as regional parks in such cases a design speed of 40km/h is to be used.

2.1.3. Centreline Radii

a. Expressway, Rapid Transit Boulevard, Urban Thoroughfare, Civic Boulevard, Urban Thoroughfare in Primary Transit Area, Main Street, Rural Thoroughfare, and Rural Connector shall be derived from the Transportation Association of Canada (TAC) Geometric Design Guide (GDG) for Canadian Roads. This chart is a summary of typical design speeds versus standard super elevation grades taken from TAC GDG for Canadian Roads – Table 3.2.4: Minimum Radii for Urban Designs.

Table 2.1 Minimum Radius (m) for Specified Design Speeds

Design Speed (km/h)	Minimum Radius (m)				
	Crown Section			Superelevated Section	
	Normal Crown[4] (+0.02 m/m)	Reverse[3,4] (+0.02 m/m)		Maximum Rate	
		e_{max} +0.04	e_{max} +0.06	+0.04 (m/m)	+0.06 (m/m)
30 (Low[1])	420	30	40	20	20
40 (Low[1])	660	65	80	45	40
50 (Low[1])	950	115	135	80	75
60 (Low[1])	1290	185	220	130	120
70 (High[2])	1680	290	330	200	190
80 (High[2])	2130	400	450	280	250
90 (High[2])	2620	530	600	380	340
100 (High[2])	3180	690	770	490	440

1. Source: *TAC GDG for Canadian Roads – Table 3.2.4: Minimum Radii for Urban Designs*

Notes

1. Values for design speeds 30 to 60 km/h based on low speed design and maximum lateral friction coefficients in Table 3.2.2 of TAC
2. Values for design speeds 70 to 100 km/h based on high speed design and maximum lateral friction coefficients in Table 3.2.1 of TAC
3. Lateral friction coefficients distributed proportional to the inverse of radius, resulting in different minimum radius values at reverse crown for e_{max} +0.04 and e_{max} +0.06. The methodology for distributing “e” and “f” is described in more detail in TAC
4. To determine the minimum radius for normal and reverse crown, the (e+f) value must be obtained from the alternative method as discussed under Urban Roadway: Design Domain Quantitative Aids and illustrated in Figure 3.2.5 of TAC

For rural and high speed urban applications the minimum radius is summarized below and is taken from TAC GDG for Canadian Roads – Table 3.2.3: Minimum Radii for Limiting Values of e and f for Rural and High Speed Urban Roadways.

Table 2.2 Minimum Radius (m) for Specified Design Speeds with Limited Values of e and f

Design Speed $(km/h)^2$	e_{max} (m/m)	Design Value for f	e + f	Minimum Radius (m) (calculated)	Minimum Radius for Design (m)
40	0.04	0.17	0.21	60	60
50	0.04	0.16	0.20	98	100
60	0.04	0.15	0.19	149	150
70	0.04	0.15	0.19	203	200
80	0.04	0.14	0.18	280	280
90	0.04	0.13	0.17	375	380
100	0.04	0.12	0.16	492	490
40	0.06	0.17	0.23	55	55
50	0.06	0.16	0.22	89	90
60	0.06	0.15	0.21	135	130
70	0.06	0.15	0.21	184	190
80	0.06	0.14	0.20	252	250
90	0.06	0.13	0.19	336	340
100	0.06	0.12	0.18	437	440
110	0.06	0.10	0.16	595	600
120	0.06	0.09	0.15	756	750
130	0.06	0.08	0.14	951	950

Design Speed (km/h)[2]	e_{max} (m/m)	Design Value for f	e + f	Minimum Radius (m) (calculated)	Minimum Radius for Design (m)
40	0.08	0.17	0.25	50	50
50	0.08	0.16	0.24	82	80
60	0.08	0.15	0.23	123	120
70	0.08	0.15	0.23	168	170
80	0.08	0.14	0.22	229	230
90	0.08	0.13	0.21	304	300
100	0.08	0.12	0.20	394	390
110	0.08	0.10	0.18	529	530
120	0.08	0.09	0.17	667	670
130	0.08	0.08	0.16	832	830

1. Source: *TAC GDG for Canadian Roads – Table 3.2.3: Minimum Radii for Limiting Values of e and f for Rural and High Speed Urban Roadways*

b. Neighbourhood Connectors and Neighbourhood Streets for new Construction

i. Neighbourhood Connectors and Neighbourhood Streets shall have centerline horizontal curves which meet or exceed the City of London Standard “Minimum Centreline Radii of Curvature for Roads in Subdivisions”. Refer to **Figure 2.1**.

ii. Neighbourhood Streets with bends of approximately 90 degrees are to have a minimum inside street-line radius in accordance with the following:

Road Allowance	Street Line Radius
20.0m	9.0m

Note: Bends of 90 degrees are only permitted on Neighbourhood Streets. Refer to **Figure 2.2**.

iii. For window street design information reference should be made to **Section 1.1.3.2**.

iv. The use of back-to-back horizontal curves or reverse curves will not be permitted on any new street. Straight tangents are required between curves, minimum tangents for varying road types will be determined by the City Engineer.

c. Reconstruction Projects

The reconstruction of existing roads is to have the centreline horizontal alignments reviewed by the applicable Project Manager on a site-specific basis.

2.1.4. Radii for Curb & Gutter

a. To improve pedestrian safety, intersection radii for curb and gutter should be made as small as the design vehicle allows.
b. Design vehicles for determining Intersection Radii are shown below in the following chart:

Approaching Street	**Receiving Street**		
	RT Boulevard, Urban Thoroughfare, Civic Boulevard, Main Street, Rural Thoroughfare	Neighbourhood Connector	Neighbourhood Street
RT Boulevard, Urban Thoroughfare, Civic Boulevard, Main Street, Rural Thoroughfare	Bus (B-12)	Bus (B-12)	Passenger Car (P)
Neighbourhood Connector	Bus (B-12)	Passenger Car (P)	Passenger Car (P)
Neighbourhood Street	Passenger Car (P)	Passenger Car (P)	Passenger Car (P)

***All** intersections that have existing or proposed bus turning movements should use a bus as the design vehicle.

c. Intersection Radii for curb and gutter should be measured at edge of pavement. If road features such as parking or on-road bike lanes provide additional road width to complete a turn, the effective radius can be used instead of the edge of pavement. Effective radius refers to the path vehicles follow when turning. The following chart illustrates the required minimum radii:

Approaching Street	Receiving Street		
	RT Boulevard, Urban Thoroughfare, Civic Boulevard, Main Street, Rural Thoroughfare	Neighbourhood Connector	Neighbourhood Street
RT Boulevard, Urban Thoroughfare, Civic Boulevard, Main Street, Rural Thoroughfare	13m	13m	7.5m
Neighbourhood Connector	10m	7.5m	7m
Neighbourhood Street	5-7m	5-7m	5-7m

***All** intersections that have existing or proposed bus turning movements should use a 13m minimum radius.

d. Daylighting Requirements
    i. A 6.0m daylight triangle is required at all intersections
e. Cul-de-sacs
    i. The minimum required radii of curvature for curb & gutters for a residential and industrial cul-de-sac are as per City of London SR-5.0 and SR-5.1.
f. Intersections with High Truck Traffic
    i. The City may require a swept path analysis to be completed and submitted to Transportation for review. When truck volumes exceed 10%, the City may require the intersection to be designed to accommodate a larger design vehicle that is most frequently expected to use the intersection.

2.1.5. Lane Widths

Lane widths shall be designed as per the City's Complete Streets Manual.

Lane widths can influence driver workload and therefore operating speed, often with narrower lanes resulting in reductions in speed. The widths of vehicle lanes can also reduce the crossing distance for pedestrians and increase the available space for sidewalks, bike lanes and other streetscape elements in constrained right-of-ways.

The minimum recommended lane widths for design speeds of 60km/h or less in constrained urban and suburban areas are listed in the table below; however, there are many considerations that can influence the appropriate lane width, including design speed, traffic volume, design vehicle, street classification, geometric constraints and operating conditions. The lane widths listed below measure the edge of pavement to the centreline of pavement markings, exclusive of gutters. Where no gutter exists include a 0.25m offset from the curb.

Lane widths should be consistent within a corridor over several blocks as varying lane widths may cause issues for driver expectations. The number and width of lanes should also be the same on a bridge deck as on the approach roadway.

Table 2.3 Minimum Lane Widths (m) for Specified Design Speeds and Lane Types

Lane Type	Design Speed	Recommended Minimum Lane Widths (metres)[1]
Through Lane	40km/h or less	3.0
	50km/h	3.0
	60km/h	3.3
Curb Lane[2]	40km/h or less	3.0[3]
	50km/h	3.3
	60km/h	3.3[4]
Right Turn Lane	N/A	3.0
Left Turn Lane	N/A	3.0
2-way Left Turn Lane	N/A	3.5
Parking Lane (including gutter)	N/A	2.2

Notes:

1. The recommended minimum widths should only be used in constrained urban environments in consultation with the City. In all other situations, lane widths shall comply with the Complete Streets Design Manual. For contexts with higher design speeds or on curved sections of roadway, wider lane widths may be required and shall be in accordance with the TAC GDG for Canadian Roads. On curved sections of roadway, a swept path analysis should be completed to confirm that lane widths are sufficient to accommodate the design vehicle.
2. In industrial subdivisions, a minimum curb lane width of 3.5m is recommended.
3. On streets where London Transit operates or is anticipated to operate, on truck routes or roads where there is a high truck volume percentage, a minimum of 3.3m is recommended.
4. For curb lanes with a single lane per direction, a minimum of 3.5m is recommended.

For Rural Thoroughfares and Rural Connectors, refer to the Complete Streets Design Manual for appropriate lane widths. For Rural Thoroughfares, a paved 2.5m wide and 0.5m wide gravel shoulder are required adjacent to the curb lane, for Rural Connectors a paved 0.5m wide and 2.5m wide gravel shoulder are required adjacent to the curb lane.

2.1.6. Right of Way, Pavement and Boulevard Widths

Pavement widths, right of way widths, and boulevard widths shall be based on the Complete Streets Manual with the following exceptions:

1) Roads shall be equally tapered and aligned based on the road centrelines. Tapers are not to be within intersections.
2) A minimum of 5.5m to be provided along the projected property lines of irregular shaped lots around the bends of streets.
3) The pavement width of Neighbourhood Connectors shall be widened to 11m when they connect to Rapid Transit Boulevard, Urban Thoroughfare, Civic Boulevard, Urban Thoroughfare/Civic Boulevard in Primary Transit Area, Main Street Neighbourhood Connector, Rural Thoroughfare and Rural Connectors. The storage length shall be 45m, taken from the end of the curb and gutter radii and the return taper should be 30m. The right-of-way at these widening should be increased to 24.0m.
4) The pavement width of Neighbourhood Streets serving 60 units or more shall be widened to 10m when they connect to Rapid Transit Boulevard, Urban Thoroughfare, Civic Boulevard, Urban Thoroughfare/Civic Boulevard in Primary Transit Area, Main Street Neighbourhood Connector, Rural Thoroughfare and Rural Connectors. The storage length shall be 30m, taken from the end of the

curb and gutter radii and the return taper should be 30m. The right-of-way at these widening should be increased to 21.5m.

5) For reconstructed Neighbourhood Streets, If the measurement of the existing road width is less than defined in the Complete Streets Manual, then use the existing width. If the measurement of the existing road width is greater than 8m, then reconstruct in accordance to the Complete Streets Manual or at a maximum width of 8m.
6) If the Cycling Master Plan indicates a cycling facility is required on a new or an existing Neighbourhood Connector, and the bike lane or cycle track is not in the boulevard, the pavement width shall be increased to accommodate cycling facilities as per the Complete Streets Manual.
7) For Neighbourhood Streets, the pavement width may be narrowed to 6.5m servicing fewer than 45 units and that have low parking utilization. Total number of units is based on number of units serviced by the Neighbourhood Connector and Neighbourhood Street including the window street units.
8) The boulevard widths are all to be in accordance with UCC-1M where applicable and UCC-2M. Refer to **Section 1.1.3.1** for further UCC-1M design criteria and **Section 1.1.3.2** for further UCC-2M design criteria.
9) Any development that exceeds 80 units shall provide for a second public access.
10) For Neighbourhood Connectors within Industrial Subdivisions, the minimum lane width should be 3.5m.

2.1.7. K Values

On vertical curves**,** K factor shall be derived from the following table:

Table 2.4 Vertical Curve K Factor for Specified Design Speeds

Design Speed (km/h)	**40**	**50**	**60**	**70**	**80**	**90**	**100**	**110**	**120**
Crest Vertical Curve Minimum K[1]	4	7	11	17	26	39	52	74	95
Sag Vertical Curve Minimum K[2]	9	13	18	23	30	38	45	55	63

1. Source: *TAC GDG for Canadian Roads Table 3.3.2: K Factors to Provide Stopping Sight Distance on Crest Vertical Curves.*
2. Source: *TAC GDG for Canadian Roads, Table 3.3.4: K Factors to Provide Minimum Stopping Sight Distance on Sag Vertical Curves*. For more information on design speed, refer to **Section 2.1.2.**

2.1.8. Maximum and Minimum Road Grades

The maximum grades of roads shall be derived from the following table:

Table 2.5 Maximum Road Grades by Road Classification

Classification of Road	Maximum Grade (%)
Expressway	4
Rapid Transit Boulevard, Urban Thoroughfare, Civic Boulevard, Urban Thoroughfare/Civic Boulevard in Primary Transit Area, Main Street, Rural Thoroughfare, and Rural Connector	6
Neighbourhood Connector	6
Neighbourhood Street	8

The minimum road grades on all roads shall be 0.5%.

a) Flat see-saw profiles (identical high and low points) will not be allowed in either road profile designs or rear yard swale designs. See-saw profiles must slope in a cascade that allows major storm flows (Overland Flows) to drain along the road or lots to an acceptable Overland Flow Outlet**.**

b) In reconstruction projects within existing developed areas of the City, where the existing profile and driveway conditions cannot accommodate a cascading see-saw profile, the proposed profile must provide for adequate road drainage and be acceptable to the City Engineer.

2.1.9. Vertical Curves

When the numerical difference between two road grades exceeds 1% a vertical curve must be incorporated using the following criteria:

- Use K value from **Section 2.1.7**
- Vertical curve length shall be numerically greater than or equal to the design speed
- When matching new vertical curves into existing ones, match the K values to provide continuity.

2.1.10. Drainage Issues

a. Overland Flow Routes

i. The design of all road profiles for New Development Projects are required to accommodate and direct major overland flow routes (OLFR) to an acceptable outlet. This design element is to be considered at the earliest

stages of design, coordinating with the SWM Unit for information, assistance, review and acceptance, all to the satisfaction of the City Engineer.

ii. The design of all major road profiles for Capital Works Projects (i.e. existing Rural Thoroughfare, and Rural Connectors, Transportation EA's, etc.) are required to consider major overland flow routes (OLFR) and where possible, accommodate and direct the OLF's to an acceptable outlet. This design element is to be considered at the earliest stages of design, coordinating with the SWM Unit for information, assistance, review and acceptance, all to the satisfaction of the City Engineer.

iii. In reconstruction projects within existing developed areas of the City, where the existing profile and driveway conditions cannot accommodate a formalized OLF Route, the proposed profile must provide for adequate road drainage and be acceptable to the City Engineer.

iv. In order of preference, OLFR should be directed along:

a. Expressway;
b. Rapid Transit Boulevard;
c. Urban Thoroughfare;
d. Civic Boulevard;
e. Main Street;
f. Neighbourhood Connector;
g. Neighbourhood Street;
h. Parks, open spaces;
i. Dedicated municipal easement - Refer to **Section 6.4.2**.

b. Culverts Under Roads

i. New culverts or culverts that are being redesigned, replaced, or impacted by road works/road widening must be designed to meet the hydraulic requirements established by MTO for inlet or outlet control culverts.

ii. City practice requires that culverts must convey the minimum storm events as specified below:

Table 2.6 Minimum Culvert Storm Conveyance by Road Classification

Classification of Road	Minimum Storm Event To Be Conveyed By Culvert
Neighbourhood Street	25-year storm event
Rapid Transit Boulevards, Urban Thoroughfare, Civic Boulevard, Urban Thoroughfare/Civic Boulevard in Primary Transit Area, Main Street, Rural Thoroughfare, Rural Connector, and Neighbourhood Connector	50-year storm event
Bridges	Major storm event, as defined in **Section 6.2.3**

iii. Requirements for culvert design are detailed in **Section 6.5.5** (Storm Culverts)

c. In the areas where parking bays are introduced, subdrain pipes should be installed longitudinally for the entire length of the parking bay. For material type and construction details refer to SW-3.1, located in the Supplemental O.P.S.S Sewers & Water section of Standard Contract Documents for Municipal Construction Projects Manual.

2.1.11. Rural Asphalt Lift Edge Taper

On rural roads, asphalt in all lifts shall be laid so that the edge of pavement is inclined at a 45-degree angle. Base lifts of asphalt shall be laid wider than surface lifts, so that a consistent slope is maintained.

2.1.12. Pavement Structure

a) Geotechnical Report: A geotechnical report shall be completed unless otherwise noted by the City's Project Manager.

b) Maximum Benkelman Beam Spring Rebound

Table 2.7 Maximum Spring Benkelman Beam Rebound (mm) by Road Classification

Classification of Road	Maximum Spring Benkelman Beam Rebound (mm)
Neighbourhood Street	1.90
Neighbourhood Connector	1.25
Rapid Transit Boulevard, Urban Thoroughfare, Civic Boulevard, Urban Thoroughfare/Civic Boulevard in Primary Transit Area, Main Street, Rural Thoroughfare, Rural Connector	0.64
Expressway	0.50

c) Municipal Projects

The pavement structure of all roads being constructed or repaired under a Municipal Project, and in New Subdivisions, shall be based on the following table:

Table 2.8 Pavement Structure Requirements by Road Classification

Subgrade Type	Component	Neighbourhood Street	Neighbourhood Connector	Rapid Transit Boulevard, Urban Thoroughfare, Civic Boulevard, Urban Thoroughfare/Civic Boulevard in Primary Transit Area, Main Street, Rural Thoroughfare, Rural Connector
"Weak" Lacustrine Clay	Asphalt	90	130	180
	Gran. A	150	150	150
	Gran. B	300	450	600
	EGT	531	712	912
"Medium" Glacial Till	Asphalt	90	130	180
	Gran. A	150	150	150
	Gran. B	300	450	450
	EGT	531	712	812
"Strong" Clayey Gravel	Asphalt	90	130	180
	Gran. A	150	150	150
	Gran. B		150	300
	EGT	330	511	711

Note: If the geotechnical investigation determines the native material is stronger & free draining, a reduction in the Granular B thickness could be considered

Table 2.9 Equivalent Granular Thickness (EGT) Factors for each component

Component	EGT Factor
Asphalt	2.00
Recycled Asphalt	1.80
Granular A	1.00
Granular B	0.67

Source: TAC - Pavement Design and Management Guide, Table 6.5, 6.6, 6.7

- Top-coat asphalt laid on Expressways, Rapid Transit Boulevards, Urban Thoroughfares, Civic Boulevards, Urban Thoroughfare/Civic Boulevard in Primary Transit Areas, Main Streets, Rural Thoroughfares, Rural Connectors and Neighbourhood Connectors shall be placed over existing or freshly laid hot mix asphalt, cold in-place recycled, or milled asphalt, and shall have a minimum lift thickness of 50mm.

- The pavement designer should specify the minimum and maximum suggested compacted layer thickness for each HMA type. The recommended minimum lift thickness is based on constructability and is generally set as three times the nominal maximum aggregate size. Generally, lift thicknesses for surface course asphalt SP12.5 and SP12.5FC1 should 40 – 50mm. Generally, lift thicknesses for binder course asphalt SP19.0 should be 50 – 80mm.
- Granular A shall be placed at a minimum depth of 150mm.
- A tack coat shall be applied on all milled surfaces and in situations where placement of asphalt lifts is separated by more than two weeks.

d) Asphalt Selection by Road Classification

Table 2.10 Asphalt Selection by Road Classification

Classification of Road	Traffic Category	PGAC	Binder Asphalt	Surface Asphalt
Neighbourhood Street	B	58-28	HL 8 or Superpave 19.0	HL 3 or Superpave 12.5
Neighbourhood Connector***	C	58-28	HL 8 or Superpave 19.0	HL 3 or Superpave 12.5
Rural Connector	C	58-28	HL 8 or Superpave 19.0	HL 3 or Superpave 12.5
Rapid Transit Boulevard, Urban Thorough, Civic Boulevard, Urban Thoroughfare/Civic Boulevard in Primary Transit Area, Main Street, Rural Thoroughfare*	D	58-28	HL 8 or Superpave 19.0	-
Rapid Transit Boulevard, Urban Thorough, Civic Boulevard, Urban Thoroughfare/Civic Boulevard in Primary Transit Area, Main Street, Rural Thoroughfare*	D	64-28	-	HL 1 or Superpave 12.5**
Expressway****	****	****	Superpave 19.0	Superpave 12.5FC1

Note: Superpave Mix design as per OPSS MUNI 1151, Table 1 and Table 2.

* With approval from TP&D, Marshall Mixes (HL8, and HL3) may be used for minor tie-in work or slip-arounds for new Subdivisions, and maintenance repairs. Road classifications above Rapid Transit Boulevard, Urban Thoroughfare, Civic Boulevard, Urban Thoroughfare/Civic Boulevard in Primary Transit Area, Main Street, Rural Thoroughfare are to be discussed with Transportation Planning and Design Division (TP&D)

** Subject to Surface Course Asphalt Policy (**Section 2.1.12.e**), this may need to be Superpave 12.5FC1.

*** For Neighbourhood Connectors with bus routes/truck routes consideration to upgrading to the major road standard (Mix and/or PGAC) shall be discussed with TP&D.

**** Expressways must be discussed with Transportation Planning & Design.

e) Surface Course Asphalt Policy

Transportation Planning & Design has set a criteria to establish a consistent application of asphalt selection on City Roads based on traffic volumes and expected life span.

Superpave 12.5FC1 is a premium surface asphalt mix with coarse aggregate that is more resistant to rutting and maintains good skid resistance. HL 4 is a coarser mix with slightly higher stability suitable for rural uses. HL3 and Superpave 12.5 are a finer mix with improved aesthetic qualities for use in urban applications with pedestrians and other active transportation uses.

Superpave 12.5FC1	• 20,000 AADT **OR** Average Daily Truck Traffic > 1,000 **AND** • Pavement life expectancy of at least 10 years
HL4	• Rural applications
HL3 and/or Superpave 12.5	• All other applications

f) PGAC

All Superpave 12.5FC1 applications shall use of PGAC 64-28 asphalt cement with a higher quality aggregate. The aggregate shall be on the MTO designated sources list and the City of London Standard Contract Documents for Municipal Projects.

HL3 and Superpave 12.5 shall use PGAC 58-28, unless a higher grade PGAC is specified by the City of London.

Where warranted and practical (typically major roads), the City is also encouraging the use of a Material Transfer Vehicle (Shuttle buggy), echelon paving and a joint heater for the placement of the surface course asphalt. Please discuss the use of these with the Transportation Planning and Design Division (TP&D) for specific projects as this approach can produce a more durable road surface for long term use.

2.1.13. Transition Between Road Types

Transition from two lanes to four or from four lanes to six should be made using the taper dimensions noted in the table in **Section 2.1.15** in relation to design speed. The transition should be clearly signed with a Wa-23 and a Wa-40 as per the Ontario Traffic Manual – Book 6. Transition from hard surface to loose surface should be signed with a Wa-25 and a Wa-25T.

2.1.14. Access and Sight Distance

Sight stopping distances and decision sight stopping distances shall be provided at all intersections and accesses as determined from Chapter 9 of the TAC GDG for Canadian Roads. As determined by Figure 9.10.1 of the TAC GDG for Canadian Roads, the following stopping sight distances shall be provided at intersections and accesses:

a. On new intersections and major accesses such as large commercial or industrial development, the desirable decision sight distance shall be provided.
b. On all other new accesses, the minimum decision sight distance shall be provided.
c. For existing accesses and single-family residences, the minimum stopping sight distance shall be provided. Desirable sight distances shall be provided in all cases.
d. Section 4.24 of City of London By-law Z-1 may require a further setback from the right-of-way of structures over 1m in height.

2.1.15. Length of Turning Lanes

Requirement for a turning lane shall be determined by the Transportation Planning and Design Division during the site plan review process, subdivision review, design or redesign of a major roadway.

Length of tapered and parallel portions of the right turn lane for flat grade 2% or less shall be determined using the following table:

Table 2.11 Taper and Parallel Length (m) of Right Turn Lanes for Specified Design Speeds

Design Speed (km/h)	50	60	70	80	90	100
Taper Length (m)	40	50	60	70	75	80
Parallel Length (m)	20	30	45	60	70	85

Length of tapered and parallel portions of the left turn lane for flat grade 2% or less shall be determined using the following table:

Table 2.12 Taper and Parallel Length (m) of Left Turn Lanes for Specified Design Speeds

Design Speed (km/h)	50	60	70	80	90	100
Taper Length (m)	85	100	115	130	145	160
Parallel Length (m)	20	30	40	50	60	70

- For more information on design speed, refer to **Section 2.1.2**. Note that distances should be increased for grades above 2% or unusual traffic conditions. Distances may be decreased if there are physical limitations on lane lengths.
- Storage requirements should be determined by a traffic study. The minimum storage on a Rapid Transit Boulevard, Urban Thoroughfare, Civic Boulevard, Urban Thoroughfare/Civic Boulevard in Primary Transit Area, Main Street, Rural Thoroughfare, and Rural Connector intersection shall be 45m. On Neighbourhood Connectors that intersect Rapid Transit Boulevard, Urban Thoroughfare, Civic Boulevard, Urban Thoroughfare/Civic Boulevard in Primary Transit Area, Main Street, Rural Thoroughfare, and Rural Connectors minimum storage shall be 45m. On all other types of intersections and accesses, minimum storage shall be 30m. In either case, storage distance starts 15m from the centreline of the cross street or at the stop bar.
- Where constrained in an urban situation, parallel length may be reduced to 0m, and taper length may be reduced to 45m.

2.1.16. Sidewalks, Bicycle Lanes and Pedestrian Walkways

a. Residential Subdivisions

i. Sidewalk shall be installed on both sides of all streets with possible exceptions in the following instances per the London Plan Policy 349. In most of these instances a sidewalk will be required on one side of the street:

a) Cul-de-sacs, dead-end streets, or crescent-shaped streets that extend less than 250 meters, do not make connections between street, and do not connect to neighbourhood features or amenities.

b) Portions of streets flanking natural heritage features or areas

c) Portions of streets flanking a Green Space that includes alternative active mobility infrastructure parallel to the street.

d) Window streets adjacent to higher-order streets such as Civic Boulevards or Urban Thoroughfares where sidewalk extensions join a boulevard sidewalk on the higher-order street.

e) Portions of streets that have a designated multi-use pathway within the boulevard on one side. Pavement structure for all boulevard cycle tracks or multi-use paths in the road right-of-way, being constructed or repaired, shall be based on SR-4.0 in the Standard Contract Documents.

f) Streets classified as Expressways or Rural Thoroughfares.

g) Street reconstruction or retrofit projects, where the existing conditions, such as mature trees, right of way widths, or infrastructure would impede sidewalks on both sides of the streets.

h) Street reconstruction or retrofit projects, where there is a council-approved Neighbourhood Connectivity Plan that doesn't include sidewalks on the street.

ii. Sidewalk Gradient – All sidewalk should follow the road gradient in a residential subdivision. The minimum gradient of a sidewalk in a subdivision is 0.5% and the maximum gradient of a sidewalk is 8%.

iii. All sidewalks constructed in residential subdivisions shall have a minimum crossfall of 2% and a maximum crossfall of 4% consistent with the boulevard crossfall.

iv. At commercial, multi-family and industrial driveway the thickness shall be 150mm reinforced, together with a granular base, unless otherwise approved by the City Engineer.

b. General

Sidewalk widths on Rapid Transit Boulevards & Main Streets shall be 2.0m-5.0m in width. All sidewalks are to be set back 1.5m from the edge of asphalt, all in boulevard cycling infrastructure are to be setback 1.0m from the edge of asphalt. In areas with high pedestrian activity the sidewalk width is to be increased to 4.0m in width. Sidewalks are required on both sides of any street if it forms part of the pedestrian system of a particular area.

c. Sidewalks that are separated from the curb and gutter by a boulevard shall be constructed at 1.5m minimum in width and 100mm in depth using concrete. Sidewalk constructed as curb-face, shall be constructed at 1.8m minimum in width and 100mm in depth. Depth of concrete should be increased to 150mm when sidewalk crosses a commercial access or egress. Depth of concrete shall be increased to 150mm at ramps on Neighbourhood Connectors and higher road classifications where a risk exists of vehicles driving over them (refer to City of London SR 1.0, 1.1, 1.2, 1.3, 1.4 & 1.5, and UCC-1M).

To review the City of London SR's please follow the link below:
https://www.roadauthority.com/Standards/

For window street design information reference should be made to **Section 1.1.3.2**.

d. Reconstruction projects are to have the sidewalk replaced or repaired if an existing sidewalk is in place. In the absence of a sidewalk the designer is to verify with the list of council-approved sidewalks in completed Neighbourhood Connectivity Plans and with the Transportation Planning and Design Division - New Sidewalk Program Priority List to determine if a new sidewalk is to be installed.

e. Bicycle lanes are to be incorporated into the road network in accordance with the City of London Cycling Master Plan. The designer is to review and confirm requirements with the Transportation Planning and Design Division.

Pavement structure for on-street bicycle lanes is to be as per the required pavement structure for the class of road on which the bicycle lane is being constructed.

f. **Pedestrian Walkways** - are to be constructed as per City of London SR-7.0.

i. General & Widths

When designing a standard 3.0m or 4.6m width walkway, ensure that the full width of the walkway is sidewalk and no grassed area. As well, ensure that catch basins are located in a manner as not to disrupt walkway usage. An example is a catch basin at the end of a walkway, as per City of London Drawing Standards SR-7.0

ii. Sidewalk

To have a crossfall of 20mm/m or alternative swales, as per City of London Drawing Standard 7.0.

iii. Removable Posts

Are to be installed at both ends of the walkway or as approved by the City Engineer, as per City of London Drawing Standard SR-8.0.

iv. Chain Link Fence

Chain link fences are to comply with the requirements of OPSS-541 and OPSD-900.01 except for the following amendments:

- the height of the fence shall read 1.2m
- the footing detail, part a: shall read in concrete.

v. Pedestrian Handrail

Where walkway grades exceed 8%, pedestrian handrails are to be constructed on one side of the walkway in line with the removable posts. Hot dipped galvanized handrails are to conform to OPSD-915.01.

vi. Stairs on Walkways

Where walkway grades exceed 10%, stairs with footings are to be constructed in accordance with City of London Drawing Standard SR-6.0.

vii. Rise and Run Dimensions for Stairs in Walkways

Are to comply with the following:

- Minimum rise – 125mm
- Maximum rise – 200mm
- Minimum run – 255mm
- Maximum run – 380mm

viii. Intermediate Landings

Where the total change in grade exceeds 1.8m, intermediate landings (no less than 1.5m) are to be provided.

ix. Sidewalk and Stair Concrete

To have at least a minimum strength of 30 MPa with 5% to 7% air entrainment and low slump.

x. Stair Reinforcement

To be #15M diameter bars with 40mm of cover in accordance with City of London Drawing Standard SR-6.0.

xi. Driveway Locations

To be located as far from the walkway as possible.

xii. Details

A plan & profile is required for all pertinent walkway designs together with all pertinent details.

xiii. Sidewalk Alignment

When there is a jog in the street line then a smooth transition (radius of 30.0m) should be shown between the two sidewalks.

xiv. Barricade and/or Warning Sign

A barricade and/or warning sign is required at the limit of a dead-end street and/or end of a proposed sidewalk on an existing right-of-way where the sidewalk terminates (Refer to OPSD 973.130).

xv. Sidewalk Termination

A temporary sidewalk shall be constructed from the end of a proposed sidewalk to the adjacent road edge, at the curb & gutter and/or gravel shoulder as required by the City Engineer.

g. Trees to be planted in accordance with the “City of London Tree Planting Guidelines”.

h. Sidewalk Ramps with Tactile Plates at Signalized and Non-Signalized Intersections

i. All sidewalk ramps at signalized and non-signalized intersections shall have cast iron tactile plates installed on them to meet the needs of AODA as following:

Exterior paths of travel, curb ramps

In this section, “curb ramp” means a ramp that is cut through a curb or that is built up to a curb. O. Reg. 413/12, s.6.

Where a curb ramp is provided on an exterior path of travel, the curb ramp must align with the direction of travel and meet the following requirements:

1. The curb ramp must have a minimum clear width of 1,200 mm, exclusive of any flared sides.
2. The running slope of the curb ramp must,
    i. Be a maximum of 1:8, where elevation is less than 75 mm, and
    ii. Be a maximum of 1:10, where elevation is 75 mm or greater and 200 mm or less.

3. The maximum cross slope of the curb ramp must be no more than 1:50.
4. The maximum slope on the flared side of the curb ramp must be no more than 1:10.
5. Where the curb ramp is provided at a pedestrian crossing, it must have tactile walking surface indicators that,
    i. Have raised tactile profiles,
    ii. Have a high tonal contrast with the adjacent surface,
    iii. Are located at the bottom of the curb ramp,
    iv. Are set back between 150 mm and 200 mm from the curb edge, and
    v. Are a minimum of 610 mm in depth. O. Reg. 413/12, s. 6.

Exterior paths of travel, depressed curbs

In this section, “depressed curb” means a seamless gradual slope at transitions between sidewalks and walkways and highways and is usually found at intersections. O. Reg. 413/12, s.6.

Where a depressed curb is provided on an exterior path of travel, the depressed curb must meet the following requirements:

1. The depressed curb must have a maximum slope of 1:20.
2. The depressed curb must be aligned with the direction of travel.
3. Where the depressed curb is provided at a pedestrian crossing, it must have tactile walking surface indicators that,
    i. Have raised tactile profiles,
    ii. Have high tonal contrast with the adjacent surface,
    iii. Are located at the bottom portion of the depressed curb that is flush with the roadway,
    iv. Are set back between 150 mm and 200 mm from the curb edge, and
    v. Are a minimum of 610 mm in depth. O. Reg. 413/12, s.6.

For sidewalk ramp with tactile plate details for signalized intersections, please refer to drawings STS 11.01 to STS 11.09. Refer to the same drawings for non-signalized intersections as well, with the exception of not having a pedestrian push button pole.

Approved manufacturers are as follows:

- East Jordon Iron Works Inc.
- Neenah Foundry Co.
- OR; approved equivalent

2.1.17. Curb and Gutter

a. Types and Applications

i. For all road classifications - excluding Neighbourhood Connector and Neighbourhood Streets - Concrete Barrier Curb with Wide Gutter as per OPSD 600.01 shall be used.

Concrete Barrier Curb with Standard Gutter as per OPSD 600.04 shall be used on all Neighbourhood Connector and Neighbourhood Streets, for any new applications from January 1st, 2021, onwards.

ii. The designer is to verify curb and gutter type with the appropriate contract administrator.

iii. The placement of barrier curbs within new subdivisions may require curb depressions to be mechanically saw cut in appropriate locations to accommodate future homes along the roadway. The location of the mechanical saw cut curb depression will match the driveway location and shall be away from other features in the boulevard (i.e., hydrant, streetlight pole, etc.). Saw cutting by hand is not permitted.

iv. Curb with Narrow Gutter as per OPSD 600.080 shall be used on an island in a cul-de-sac and medians on roads.

b. Transition/Termination

i. A transition of 3.0m is required between curb types. Curb transitions must occur on the road with the lower classification, minimum 1.0m away from the end of the radius.

ii. Curb termination as per OPSD 608.01 shall be used within temporary turning circles and dead-end streets or intersections which abut or are adjacent to a future phase of a subdivision.

c. **Catchbasins**

i. Refer to **Storm Sewer Section 5.16** in this manual for design information regarding catchbasins.

ii. A concrete curb setback is required for all catchbasins and curb inlet catchbasins located on the right-of-ways. Refer to City of London SR-3.0.

iii. Curb inlet catchbasins shall be used exclusively on roads classified as Expressway, Rapid Transit Boulevard, Urban Thoroughfare, Civic Boulevard, Urban Thoroughfare/Civic Boulevard in Primary Transit Area, Main Street, Rural Thoroughfare, Rural Connector, or in areas where there is an interest to drain the road surface more quickly.

iv. Mini-catchbasins should be installed at low points in Expressway, Rapid Transit Boulevard, Urban Thoroughfare, Civic Boulevard, Urban Thoroughfare/Civic Boulevard in Primary Transit Area, Main Street, Rural Thoroughfare, Rural Connector until placement of top asphalt. (See **Section 5.16.15**).

d. **Curb Radii Elevations**

Required at all Beginning of Curves (B.C.) and End of Curves (E.C) of curvatures of intersections, cul-de-sacs, islands and medians.

Note: a gutter elevation is required at the top end of all cul-de-sacs.

Curb Radii Grades – A minimum of 0.5%.

Curb & Gutter Around Full Radius – Required at all intersections of subdivision streets and boundary road works adjacent to existing and future development. The curb & gutter is to be extended around the full radius at the corner and the sidewalk is to meet.

Concrete Strength – Refer to OPSS 353.05.01

e. **New Access**

Any new accesses to existing roads are required to attain a permit from the Environmental Programs and Customer Relations Division.

2.1.18. Erosion Control Blanket

Straw mat and curled wood excelsior type erosion blankets shall conform to OPSS-804. For types not described in this standard, North American Green SC150 or approved equal shall be used. See also **Sediment & Erosion Control, Section 10** in this manual.

2.1.19. Pavement Markings

Centre line pavement markings will be required on all Street classifications except Neighbourhood Streets.

All pavement markings are to be designed in accordance with the Ontario Traffic Manual and City of London Standards. Proposed designs shall be submitted to the Roads and Transportation for approval a minimum of two weeks prior to application. Temporary pavement markings shall include lane divider lines, lateral crosswalk lines, and stop bars may be traffic paint. All final pavement markings shall be of a durable material as defined in OPSS. Green surface treatment for cycling facilities, longitudinal crosswalk markings and stop bars to have an anti-skid resistance of 50 BPN to 65 BPN (British Pendulum Number).

Pre-marking of topcoat and base asphalt shall be completed within 24 hours. The application of the pavement markings shall be within 24 hours after acceptance of the pre-markings by Roads and Transportation. Temporary pavement markings will be required if the topcoat of asphalt is scheduled more than 2 weeks after the base asphalt is complete.

Traffic signage shall be designed in accordance with the applicable Ontario Traffic Manual and City of London Standards. Cycling Facility Signs to be installed with the appropriate lane divider lines.

Pavement markings and traffic signs shall be shown on the same drawing. Traffic signs shall include the OTM reference number, a graphic of the sign and station/offset. Pavement marking requirements for winter shut down.

Winter shut down or other long pauses of construction when the right-of-way is open to any modes of traffic requires lane divider lines, stop bars, crosswalk transverse lines, and bicycle lanes in temporary paint. Ladder markings and green surface treatment is not required. All regulatory, warning and information traffic signs are required to promote safe and enforceable operation of the right-of-way.

Pavement markings and traffic signs shall be shown on the same drawing. Traffic signs shall include the OTM reference number, a graphic of the sign and station/offset.

2.1.20. Pavement Reinforcement

Pavement reinforcement in the form of stepped milled joints shall be used for road widening, lane additions, and utility cuts greater than 1m in width and 3m in length.

Utilize the requirements noted in City of London SR-13.1: *Stepped Milled Joint Pavement Reinforcement Detail*. Joints should be out of the alignment where tires will normally track. The pavement and granular base for the reinforcement shall be identical to or greater than the existing road structure. Notwithstanding this, a minimum of 150mm of granular 'A' (to 98% Proctor) and 100mm of compacted hot mix asphalt (to 97% Marshall) shall be used. Where there is significant truck transport traffic, increase this minimum to 200mm of granular 'A'.

2.1.21. Roadside Protection

Roadside protection shall be applied in accordance with the Ministry of Transportation's Roadside Safety Manual.

2.1.22. Sediment & Erosion Control

The City of London requires an Erosion Sediment Control Plan (ESCP) be designed for most Capital Works, Operational and Development Projects. The complexity of the ESCP is determined by the sensitivity of the area that is to be protected.

For reconstruction or resurfacing of existing roads, or for infill sites less than 3.0 ha in land area within existing urbanized areas, that are not in close proximity to an open watercourse, woodlands, ESA's, steep slopes, or other natural area; an ESCP is not required, unless otherwise directed by the City Engineer. Where an ESCP is not required, all reasonable protective measures must be taken during construction to control sediment and prevent erosion from occurring.

For further information on the requirements of the ESCP, please refer to **Section 10 – Sediment & Erosion Control**, within this manual.

2.1.23. Bus Bays

Bus Bays shall be constructed at 200mm in depth of concrete. It shall have a cross fall of 2%. Standard Bus Bay shall have a minimum taper of 15.0m and minimum storage of 15.0m.

Storage dimensions are for one bus. Add 14.5m for each additional standard bus and 20.0m for each additional articulated vehicle.

Actual dimensions should be consulted with London Transit Commission.

See **Figure 2.1.22 Concrete Bus Bay** for details.

2.1.24. Access Configurations

i. **Single Family** accesses are to be in accordance with Standard Contract Documents Drawings SR-2.0.

Should a conflict occur between the location of a driveway and the location of a curb inlet catchbasin (CICB), then the Owner shall correct the conflict by either relocating the driveway, except when a parking plan governs, or replacing the CICB with a twin inlet catchbasin in the same location as the original CICB, all to the specifications of the City Engineer and at no cost to the City.

ii. **Development blocks for site plan approvals** access configurations shall be in accordance with Ontario Provincial Standard Drawing 350.010 with dimensions as set out in the City's Access Management Guidelines.

No catchbasins, existing or proposed shall be located within the limits of site entrances. In situations where existing catchbasins would be within proposed site entrances, the access shall be realigned so to avoid catchbasins or the catchbasin shall be relocated outside the access curb return.

iii. Emergency access configurations shall be in accordance to City Standards with respect to adequacy of sight lines, provisions of channelization, adequacy of road geometries and structural design, etc. to the satisfaction of Transportation Planning and Design.

2.2. Intersections

2.2.1. At Grade Road/Rail Intersections

All railway crossings at grade in built-up areas shall be protected by the text warning sign "Cyclists Use Caution Crossing Tracks".

2.2.2. Road/Road Approach Grades

Refer to TAC – Geometric Design Guide for Canadian Roads

2.2.3. Road Layouts

When two (2) streets intersect they shall connect at 90 degrees with 10 metre straight tangents measured back from the street line in all directions.

In situations where this is not achievable, deviations may be considered following approval from Transportation Planning and Design.

2.3. Traffic Calming

2.3.1. Application and Methodology

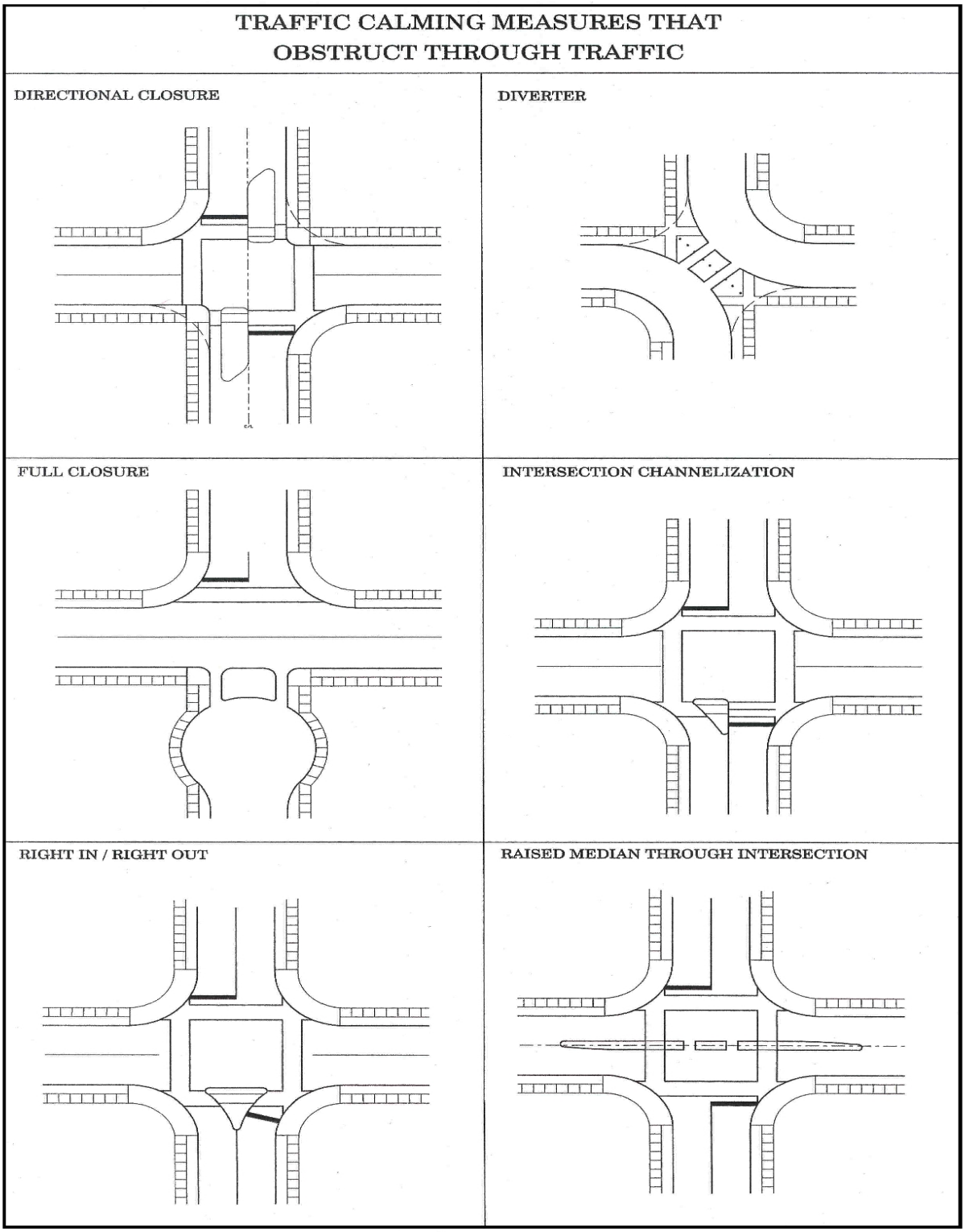
Traffic calming measures are applied on Neighbourhood Connectors in residential areas, and occasionally on Neighbourhood Streets. They enhance residents' quality of life by encouraging low traffic speeds and volumes, minimizing conflicts between types of street users, and discouraging through traffic. Traffic calming makes the area safer and more inviting for pedestrians and cyclists, without restricting local motorists' access to the transportation network.

To be effective, traffic calming shall be applied only after careful study of the local transportation network and land use. It should be implemented on an area-wide basis, considering impacts on the surrounding road system. Non-motorized modes of travel should not be impeded by the applied measures. Consultation on the impact of the measures on emergency services, transit, snow plowing, street cleaning, garbage removal and stormwater overland flow routes as well as opportunities for stormwater infiltration (Low Impact Development) where appropriate shall be completed as part of the planning process. Traffic Calming measures shall be proactively installed in school zones.

Traffic calming is only one design tool for safer roads. The most effective traffic calming measures have modest negative impacts on some aspects of the area in which they are installed. Because of this, other techniques such as education and enforcement, and design factors such as pavement width and street network design, should be considered in any traffic calming study.

Generally, traffic calming features should be spaced no more than 100m apart to achieve maximum efficiency.

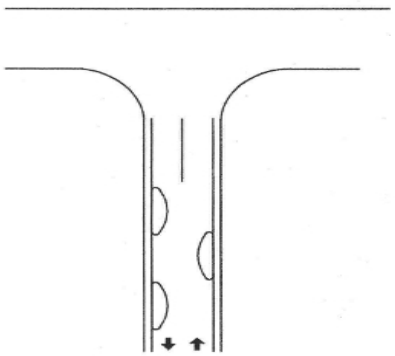
The following 6 measures can be used to obstruct through traffic.



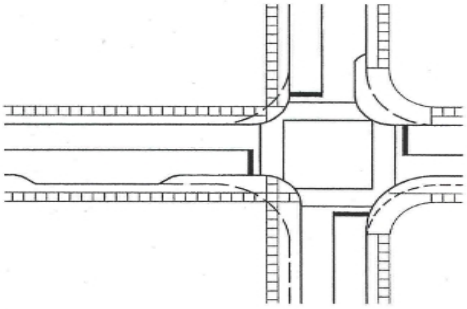
The following 6 measures can be used to reduce vehicle speeds and through traffic.

TRAFFIC CALMING MEASURES
TO REDUCE VEHICLE SPEEDS & THROUGH TRAFFIC

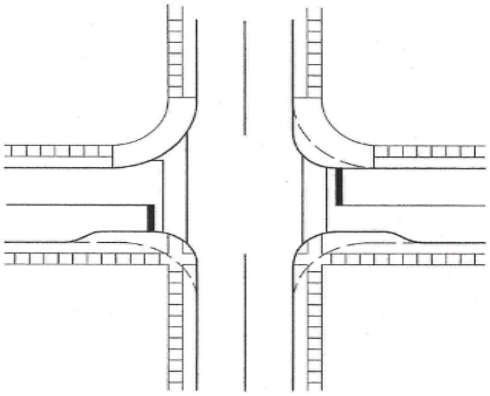
CHICANE



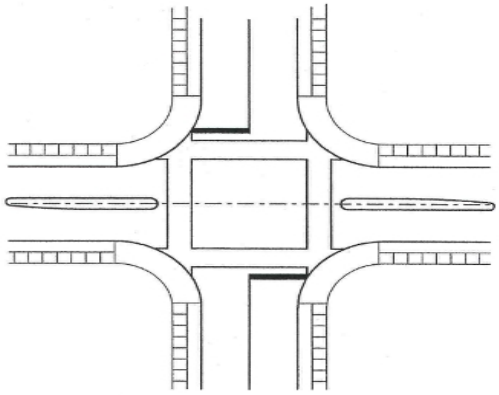
CURB EXTENSIONS / PARKING BAYS



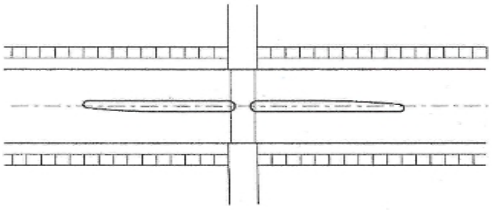
CURB RADIUS REDUCTION



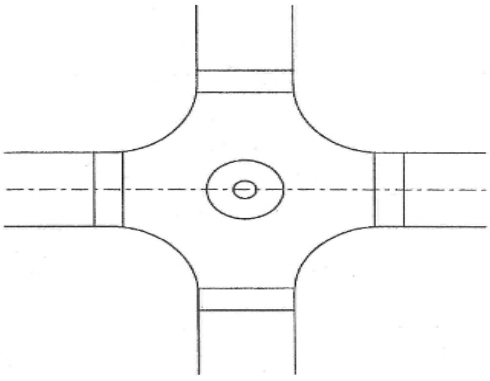
RAISED MEDIAN ISLAND



MID-BLOCK RAISED MEDIAN
WITH CROSSWALK



TRAFFIC CIRCLE



2.3.2. Signage

a. Entrance points to areas in which traffic calming measures have been installed, shall be posted with the Traffic Calmed Neighbourhood sign. See section 4.5.2 in the T.A.C. *Canadian Guide to Neighbourhood Traffic Calming*.

   The Transportation Planning and Design Division may elect to use appropriate regulatory signs from the Ontario *Manual of Uniform Traffic Control Devices* as a traffic calming measure. Appropriate signage may include, but is not limited to, Maximum Speed, Right or Left Turn Prohibited, One Way, and Stop signs.

b. Street Name Signing; refer to **Figure 2.3.1**

c. Street Name Signs, Traffic Control Signs, and steel round post locations to be determined during the subdivision design review stage. Locations may be included on the streetlight design drawings or on stand-alone traffic control drawings.

d. Steel round posts and Street Name Signs to be installed as per OTM Book 1b Sign Design Principles within 2 months after curb and gutter is placed. Once Steel round posts and Street Name Signs are installed, Traffic Engineering Division will inspect the locations to verify before adding appropriate traffic control to a Traffic & Parking & By-law amendment report for future Civic Works Committee and Council Meetings to review. Once passed at Council meeting the appropriate traffic control signs can be installed.

2.3.3. Curb Extensions and Reduced Radii

Curb extensions are the delineation of the parking lane through the addition of a roll-over curb and gutter. The impact is that the through lanes are visually and spatially constricted at all times like they are when vehicles are parked along one side of a roadway. Tangent sections should be 5m at intersections, fire hydrants and public walkways. Tangent sections should be 15m at bus stops. Tapers in and out of curb extension streets should be made over a minimum of 30m. Reduced radii are used on the inbound radius into a local street. The impact of the reduced radii is to force vehicles to slow down considerably before making the turn. This calms the traffic speeds on the collector road as well as the local street. Refer to **Figure 2.3** – Curb Extensions and Reduced Radius.

2.3.4. Speed Cushions

Speed cushions are used to reduce vehicle speeds, by causing discomfort to occupants of vehicles crossing them at high speeds. Speed cushions shall be made of HL3 Asphalt Mix, unless directed otherwise by the City Engineer

Refer to **Figure 2.3.4** - Speed Cushions.

All sides of the cushions shall be ramped to allow drainage. All edges of the ramps should be formed and keyed into the existing asphalt to provide adequate drainage and a continuous road surface. The leading edge of the ramps shall be marked with durable solid white reflective triangles, with the point at the top of the ramp. A Speed Cushion sign (T.A.C. *Canadian Guide to Neighbourhood Traffic Calming* Wa-50) shall be installed beside the leading edge of the ramp.

2.3.5. Raised Crosswalk Design

Raised crosswalks are crosswalks constructed in concrete to a height of 150mm above the elevation of the street. Raised crosswalks are very effective at reducing vehicle speeds specifically where pedestrians will be crossing a street (see **Figure 2.3.12**)

Note: Catchbasins are to be provided at upstream end of raised crosswalks to allow for drainage.

2.3.6. Diverter

A diverter is a barrier placed diagonally across an intersection, to force turns and prevent travel in a straight line. It is used to reduce through traffic by prohibiting travel in some directions.

The diverter should be not less than 1.5m in width at its narrowest point. The barrier shall consist of semi-mountable curbs to allow emergency vehicles to negotiate the turn in an emergency, and either

a. bollards spaced at 1.5m intervals along its centreline, or
b. sufficiently dense landscaping to prevent crossing by vehicles.

2.3.7. Rights In/Rights Out Raised Concrete Median ("Pork Chop")

a. A raised concrete median is used to prohibit straight-through and left turn movements both into and from the protected approach and shall be designed in accordance with the most current City of London Access Management Guidelines, section 2.1. The City of London Access Management Guidelines are available by request through the Transportation Planning and Design Division.
b. A rights in/rights out island should only be used in locations where it is very difficult/or impossible to implement on street raised concrete median. A rights in/rights out island is roughly triangular and placed in the centre of an intersection approach. A minimum size of $10m^2$ is required to provide pedestrian refuge. Both the in and out lanes shall be not less than 6m in width. The island shall be protected by barrier curb OPSD 600.01, except at pedestrian crossings.

The signage shall be in compliance with Figure 4.16 in the *Canadian Guide to Neighbourhood Traffic Calming*, with equivalent signs for those required by the drawing.

2.3.8. Directional Closure

A directional closure is a concrete island or curb extension that physically obstructs one or more lanes of a roadway at an intersection. It may restrict entry or exit. The closure shall be protected by barrier curb OPSD 600.01, except at pedestrian crossings.

Signage shall be equivalent to the following:

a. for an exit-only closure, Figure 4.11(a), Canadian Guide to Neighbourhood Traffic Calming, or

b. for an entrance-only closure, Figure 4.11(b), Canadian Guide to Neighbourhood Traffic Calming

Equivalent signs shall be substituted for the signs required in the drawings.

2.3.9. In/Rights Out ("Banana") Island

An In/Rights Out Island is a curved island positioned to discourage left turns and through traffic movements from the protected approach. The island shall be not less than 5m in length and 1.5m in width. A minimum size of $10m^2$ is required to provide pedestrian refuge. Both the in and out lanes shall be not less than 6m in width. The island shall be protected by barrier curb OPSD 600.01, except at pedestrian crossings.

Where possible, the island should terminate so that it does not intersect the crosswalk. Signage shall consist of:

a. a Hazard Marker sign Wa-33L mounted under a Keep Right sign Rb-25 at the leading edge of the island, and

b. a Right Turns Only sign Rb-42 on the right-hand side of the protected lane, opposite the signs in (a).

2.3.10. Roundabouts

A roundabout is a raised island located in the centre of an intersection, which requires vehicles to travel through the intersection in a counter clockwise direction around the island.

Refer to **Figures 2.5, 2.5A, 2.6, 2.7, 2.8, 2.9, 2.10, 2.12, 2.13, 2.20A, 2.20B, 2.21A, 2.21B** as required for appropriate details.

All approaches to the circle shall be protected by a Yield sign, so that vehicles already traveling on the roundabout have right-of-way over vehicles entering it. A One-Way sign Rb-21A, indicating a counter-clockwise direction of travel, shall be installed on the centre island opposite each approach.

For curb and gutter types within the roundabouts refer to **Figure 2.7** - Typical Section and Landscaping of Central Island.

For maintenance purposes, sanitary maintenance holes are not permitted to be located within the raised centre island of the roundabout. The sanitary maintenance hole is to be located within the apron of the island. Storm maintenance holes may be located within the centre island of the roundabout, provided the proposed landscaping does not hinder access to the maintenance hole.

2.3.11. Raised Median Traffic Islands

Raised median traffic islands may be installed in the centre of roads with at least 8m pavement width. A concrete island is used to reduce pavement width and thereby reduce the speed of passing traffic.

A minimum width of 3.5m shall exist between the curb faces on both sides of the island. The island shall be no less than 5m in length, with the maximum length dictated by local conditions. A longer island is desirable. The island shall be not less than 15m distance from all intersections. It should have barrier curb around its perimeter, except at pedestrian ramps, driveways, or openings to accept road runoff in to a planted or sodded median. Wherever possible, the grade of the road should be designed to allow water to drain into planted or sodded medians. In this case, gutter-less curb may be installed around the perimeter of the island. Both ends of the island shall be marked with Keep Right Rb-25 sign, mounted over a Hazard Marker Wa-33L sign.

The median island can also have a pedestrian refuge feature. The requirement for such design should be determined in the planning stages by Transportation Planning and Design Division (TP&D).

For Pedestrian Refugee Island Design refer to figures.

- Pedestrian Refuge Island - **Figure 2.3.10**
- Pedestrian Refuge Island – Sections - **Figures 2.3.10A&B**

A minimum width of 4.0m shall exist between the curb faces on both sides of the island. The island shall be not less than 5m in length, with the maximum length dictated by local conditions. A longer island is desirable. The island shall be not less than 15m distant from all intersections. It should have barrier curb around its perimeter, except at pedestrian ramps and driveways if not restricted by Transportation Planning and Design Division. Wherever possible, the grade of the road should be restored so that water drains to the existing curb and gutter. In this case, gutter-less curb may be installed around the perimeter of the island. Both ends of the island shall be marked with Keep Right Rb-25 sign, mounted over a Hazard Marker Wa-33L sign.

2.3.11.1. Raised Intersections

Raised intersections are raised areas covering an entire intersection, with ramps on all approaches. Raised Intersections rise above the road level to provide a “lip” that is detectable by the visually impaired. By modifying the level of the intersection, the crosswalks are more readily perceived by motorists to be “pedestrian territory”.

Raised intersections are good for intersections with substantial pedestrian activity, and areas where other traffic calming measures would be ineffective.

For Raised Intersection Design refer to figures.

- Raised Concrete Intersection - **Figure 2.3.2**
- Raised Concrete Intersection Detail and Cross-Section – **Figure 2.3.2a**

2.3.12. Subdivision Neighbourhood Connector Entrance

In general, Neighbourhood Connector entrances into subdivisions from Rapid Transit Boulevards, Urban Thoroughfare, Civic Boulevard, Urban Thoroughfare/Civic Boulevard in a Primary Transit Area, Main Street, Rural Thoroughfare, and Rural Connectors should be as per **Figure 2.16** (Gateway without island). Where a Neighbourhood Connector is proposed opposite an existing Neighbourhood Connector which includes a widened gateway treatment, the new road is to be widened and aligned to be compatible with the existing road and consistent with **Figure 2.16B** (Gateway with island), to the satisfaction of the City Engineer.

2.3.13. Temporary Measures

Temporary traffic calming measures shall be reviewed and approved by the Transportation Planning and Design Division prior to installation.

2.4. Traffic Signals

2.4.1. Traffic Control Signal Warrants

Traffic signals shall be considered warranted if:

a. intersection conditions meet or exceed the warrant requirements of Section 4.3 of the Ontario Traffic Manual – Book 12;

b. approval is granted by the Traffic Engineering Division, and

c. approval is granted by City Council as per City Policy 25(15).

2.4.2. Intersection Pedestrian Signal (I.P.S.) Warrants

Intersection pedestrian signals shall be considered warranted if:

a. conditions meet or exceed the warrant requirements of Section 4.8 of the Ontario Traffic Control Manual – Book 12;

b. approval is granted by the Traffic Engineering Division, and

c. approval is granted by City Council as per City Policy 25(15).

2.4.3. Electrical Design

Electrical design for intersections shall be governed by the following three documents, in order:

a. The City of London's Traffic Signal and Street Lighting Specifications (STS);

b. items not addressed in (a) shall conform to the Ministry of Transportation *Traffic Signal Design* manual, where addressed; and

c. items not addressed in (a) or (b) shall conform to the Ontario Provincial. Standards & Specifications (O.P.S.S.).

To review the City of London STS document, please follow the link below:
https://www.roadauthority.com/Standards/

2.4.4. Signal Plant Design

The design of Traffic Signals, Temporary Traffic Signals and the Relocation of Existing Traffic Signals must be completed, signed and sealed by a fully qualified *Professional Electrical Engineer* that meets the criteria identified in the Registry, Appraisal and Qualification System (RAQS) list. Designs must be submitted to the Traffic Engineering Division for review and acceptance prior to any construction work being undertaken**.**

2.4.5. Pavement Markings

Permanent pavement markings shall be designed in accordance with the Ontario Traffic Manual – Book 11. Proposed designs shall be submitted to the Traffic Engineering Division for approval, prior to application.

2.4.6. Materials

Materials used for traffic signals shall be in conformance with the requirements of the City of London Traffic Signals and Street Light Specifications.

2.5. Street Lighting

2.5.1. Warrants

Street lighting shall be considered warranted on all roads in urban areas. At isolated rural intersections with non-continuous lighting on the intersecting roads, street lighting shall be considered warranted if the roadway meets or exceeds the requirements of the warrant provided in the Transportation Association of Canada Illumination of Isolated Rural Intersections guide.

Reconstruction of a substandard, isolated rural intersection should be considered before illumination. Street lighting may also be installed at isolated rural intersections at the direction of the Traffic Engineering Division. Situations when this is warranted may include but are not limited to the occurrence of rare but severe collisions, an inability to maintain adequate hazard markings for raised channelizing islands, or the presence of an unusual number of long combination vehicles with reduced accelerating and braking abilities.

2.5.2. Materials

All street and walkway light fixtures shall be LED, full cut-off, 120V, integrated 7 pin dimming control capability utilizing an external 0-10VDC control signal. Streetlight fixtures on for Residential Subdivisions shall conform to the standards shown in **Figures 2.17 to 2.21B**. Fixtures on all other roads must have a correlated colour temperature (CCT) of 4,000 +/- 500 K. The CCT of fixtures within Residential Subdivisions and walkway lights shall be 3,000 +/- 500 K. Materials used for streetlights shall be in conformance with the City of London's Traffic Signal and Street Light Specifications. Contact the Traffic Engineering Division for a current list of accepted LED streetlight fixtures for Rural Thoroughfares, Rural Connectors, Main Street, Civic Boulevards, Rapid Transit Boulevards, Urban Thoroughfares and Expressways.

2.5.3. Street Light Designs

The design of streetlights for Residential Subdivisions must be designed, signed and sealed by a Professional Engineer. The design of streetlights on all other roads must be designed, signed and sealed by a pre-qualified Professional Electrical Engineering Consulting Companies.

The design of street illumination shall conform to the requirements set out by American National Standard Practice for Roadway Lighting (ANSI/IESNA RP-8-21)

1. Streetlight designs for Residential Subdivisions shall conform to the standards shown in **Figures 2.17 to 2.21B** with **NO SUBSTITUTION** of streetlight fixtures. Photometric designs are not required for these roads.
2. Detailed photometric designs shall be submitted for all other roads, intersections and sidewalks demonstrating how the RP-8-21 standards have been satisfied without excessive over lighting. Illumination at intersections may require a higher wattage fixture than the remainder of the road. Contact the Traffic Engineering Division to confirm the appropriate road classification and pedestrian conflict **prior** to undertaking the photometric design. In addition to the photometric drawings, the results of the photometric design must be displayed in a table similar to the following: (see table below)

	L_{avg}	L_{avg}/L_{min}	L_{max}/L_{min}	L_{max}/L_{avg}
Major Road with Medium Pedestrian Conflict	0.9	3.0	5.0	0.3
Luminaire name	**RESULTS**	**RESULTS**	**RESULTS**	**RESULTS**
	E_H (lux/fc)	E_{Vmin}(lux/fc)	E_{avg}/E_{min}	
Sidewalk with Medium Pedestrian Conflict	5.0/0.5	2.0/0.2	4.0	
Luminaire name (Near side)	**RESULTS**	**RESULTS**	**RESULTS**	
Luminaire name (Far side)	**RESULTS**	**RESULTS**	**RESULTS**	

3. Streetlight fixtures shall be located such that current and future tree canopies do not interfere with the distribution of the light.
4. The use of streetlight fixtures mounted over the travelled portion of the road is encouraged to avoid trees and to achieve improved streetlight spacing.

5. The drawings shall show the location of the streetlights (indicated by an open circle), streetlight conductors, the location of transformers and the location of power disconnects. The drawings shall specify the type of pole, fixture, conduit, fixture wattage, conductor and 20kv 10ka breakers being used.
6. Streetlights should be placed wholly on one lot at the property line whenever possible.
7. The maximum number of lights that can be attached to a single circuit is 10 unless voltage drop calculations are provided that demonstrate the circuit can accommodate the load.
8. Existing streetlights shall be shown as solid black circles.
9. The streetlight cable should be indicated by a black line with an SL imposed on the line.
10. All streetlight wire road crossings shall be placed in a 75 mm RPVC duct with handholds (per STS-1.08) at either end of the road crossing.
11. Designers should be aware of driveway locations and living room windows when determining the location of lights.
12. The design is to be drawn at a 1:500 scale.
13. Streetlight poles on Neighbourhood Connectors and Neighbourhood Streets with residential dwelling units to utilize a maximum mounting height of 4.5m.
14. Final designs must be accepted by the City of London's, Traffic Engineering Division. Main Street and Rapid Transit Boulevards are to have pedestrian scale lighting using poles capable of accommodating banners, hanging baskets and other decorative elements.
15. In the legend beside the streetlight symbol, it should show Manufacture Wattage Model Information (e.g., Eaton 52W MSA-EO2-LED-E1-SL3-AP-PER7-7030-DIM-HSS).
16. If the existing streetlight fixture is not on the City of London approved fixtures list, then one of the approved fixtures must be used.

2.5.4. Walkway Lighting Design

Walkway lighting designs shall be comprised of the following:

1. 26 W Eaton AVS or 35 W Lithonia KAD LED fixtures.
2. 4.6m pole base mounted (black powder coated galvanized square tapered steel or aluminium).
3. The first light from the street should be 15m from the back of the sidewalk or 15m from the edge of pavement if no sidewalk is present;

4. Spacing along of the light along the walkway should be approximately every 30m, noting most walkways require only one additional light usually located at the rear of the residential property line; severe bends or stairs may require tighter spacing;
5. Walkway lights are to intersect street circuits at a junction box located at one end of the walkway and adjacent to each walkway light.
6. Walkway light conductor shall be placed in a 50mm RPVC conduit.
7. The pole base shall be located immediately adjacent to the fence line so that the pole is placed as close as possible to the fence line.
8. Bollards located at either end of a lit walkway must be removable for maintenance purposes.

2.5.5. Residential Street Light Installation & Inspection Guidelines

1. The same or similar light standard must be used from one end of a street to the other regardless of how many phases of construction are involved. If the existing streetlight fixture is not on the City of London approved fixtures list, then one of the approved fixtures must be used.
2. Poles and luminaries take a minimum of 8 weeks to be delivered. The City does not stock any residential streetlights for new construction.
3. A power disconnect utilizing 20kv 10ka breakers must be installed at the first streetlight from the transformer. All installations must be inspected by the Electrical Safety Association (ESA) prior to London Hydro doing the power connection. The Contractor is responsible for arranging inspection with ESA.

2.6. Construction Signage

2.6.1. General

Use the Ontario Traffic Manual - Book 7 - Temporary Conditions for all construction signage applications.

2.6.2. Traffic Management Plans

2.6.2.1. Definition

The Traffic Management Plan (TMP) is a construction scheduling tool that effectively harmonizes the constructions project's physical requirements with the operational requirements of the City of London, the transportation needs of the road users within the City and access concerns of the local residents.

2.6.2.2. Traffic Control Plan vs. Traffic Management Plan

The requirements of the Ministry of Labour and the Ontario Traffic Manual Book 7 construction works (the requirements for a Traffic Control Plan (TCP) and Traffic Protection Plan (TPP)) are different from the City of London's Traffic Management Plan (TMP). The TMP is a plan that shows the construction methodology that will ensure through traffic movement, utility services, pedestrian & cyclist traffic, and vehicular access to the areas adjacent to the construction site, while allowing for the construction of the desired works. TCP's and TPP's list specific temporary signs and barricades to be installed.

For basic, straightforward utility projects, the City will receive a TCP/TPP, review it for General Conformance with City of London Traffic Management Plan Requirements, OTM Book 7 and OTM Book 18 and decide whether or not to accept the TCP/TPP to allow for the issuance of a PAW. However, the City of London will not complete an in-depth review or accept a Contractor's Traffic Control Plan or Traffic Protection Plan. For ALL Development related projects and complex, multistage/multi-phase capital works or utility projects; a TMP is required. Please refer to **Section 2.6.2.4 Traffic Management Submission Requirements**, for further information.

2.6.2.3. When is a TMP Required?

A TMP is required whenever development/utility related works (closure, resurfacing or reconstruction) affect any portion of the City roadway as itemized below:

a. A TMP is required:
    i. For any work being done on the paved portion of an Expressway, Rapid Transit Boulevard, Urban Thoroughfare, Civic Boulevard, Urban Thoroughfare/ Civic Boulevard in a Primary Transit Area, Main Street, Neighbourhood Connector, Rural Thoroughfare, Rural Connector;
    ii. Where a full road closure of any class of road is proposed for longer than ½ a day duration;

iii. For any partial road closure on an Expressway, Rapid Transit Boulevard, Urban Thoroughfare, Civic Boulevard, Urban Thoroughfare/ Civic Boulevard in a Primary Transit Area, Main Street, Neighbourhood Connector, Rural Thoroughfare, Rural Connector, Neighbourhood Street where the road closure is for any length of time; or

iv. Any work on downtown core streets (as defined by the London Plan).

v. For any work that may affect LTC services, emergency services or will have direct impact on pedestrians.

b. A TMP is not required for work on Neighbourhood Streets, except as noted in **2.6.2.3.a) ii)**, above, or in **2.6.2.3 c)** exceptions, below.

c. Exceptions:

Some exceptions due to depth of work, width of work, use of road (i.e. fronting a hospital, bus routes, school, etc.), may apply. In these site-specific situations, discussion with the Transportation Planning and Design Division will be required to determine if a TMP is required.

TMP's are required for both assumed and unassumed roads if there is an impact on traffic flow. For example, an undeveloped dead end unassumed street may have no public traffic and may not need a TMP.

2.6.2.4. Traffic Management Submission Requirements

The complexity of the TMP required is determined by the complexity of the proposed works.

2.6.2.4.1 For basic, straight forward UTILITY projects, the following information shall be provided:

a. a brief description of the work, including the anticipated duration of the work;

b. the location of the buildings/driveways and the municipal address, street names, including cross streets and intersections if any;

c. show all lanes for each road on the drawing and define the proposed lane widths;

d. state the impact on sidewalks, cycling infrastructure, LTC bus stops/school bus stops, driveways (if any), and how they will be addressed;

e. submit a copy of the TCP with a Work Approval Permit a minimum of 5 days prior to initiating the works. Complex projects may require additional time and consultation.

The Traffic Management Plan should be a reflection of a suitable layout from OTM Book 7 and include signage from OTM Book 18 if cycling lanes are interrupted; quote the Fig. No. for our reference and refer to Table A for short duration work and Table B for long duration work. The signage and the distances between the signs should reflect the appropriate typical layout figure and tables.

2.6.2.4.2 For ALL Development related projects, and complex, multi stage/multi-phase Capital Works or Utility projects, more detailed information shall be provided, and these plans should form part of the construction detailed design drawing package and tender:

a. The TMP is required to demonstrate the design staging in a set of drawings, sealed by a Professional Engineer;
b. written verification that all works will be conducted within the Ministry of Labour, OPSS and the Ministry of Transportation standards;
c. Full plan coverage of the work area that is drawn to scale, and shows:
    i. property lines
    ii. utility plant locations
    iii. proposed areas of removals (show all physical infrastructures to be removed, including bushes & trees)
    iv. planned restoration
    v. construction staging
d. Typical cross sections drawn to scale showing:
    i. widths of lanes (temporary pavement markings)
    ii. location of temporary traffic barriers & barricades (off set distances)
    iii. depth location and size
    iv. offset distances to 1:1 side slopes
e. The exact/specific location's road section or intersection affected
f. The type of closure required (e.g. sidewalk, bike path, one lane, two lanes, full closure, etc.), the duration of the closure
g. How the closure relates to the stages/phasing of the project (if applicable)
h. How the closure relates to stages of adjacent projects

i. How the closure protects the safe movement of pedestrians and traffic on the right of way, or accessing/egressing the right-of-way, including but not limited to:
    i. LTC bus stops
    ii. sidewalks
    iii. cyclists
    iv. para transit stops
    v. school bus stops
    vi. illumination
    vii. edge drop-offs
    viii. emergency vehicle access

j. How the work accommodates: traffic signal operations, storm/sanitary sewer installations, and winter maintenance

k. How notification is planned to coordinate with the required agencies/departments and the public. Advance notification and warning signs (TC-64s, TC-67s, PVMS) shall be provided in the TMP, including text and location.

l. PVMS should only be specified in the following situations:
    i. Advance 2-week notification of closures due to construction.
    ii. Advance notification of major special events impacting traffic.
    iii. Notification of lane closures and detours during construction, maintenance and special events not exceeding 2 weeks.
    iv. Temporary notification of long-term conditions in the interim until static signs can be manufactured.

2.6.2.5. Specific Requirements of the Plan during Road Resurfacing or Reconstruction

a. On a two-lane road section, one lane be open at all times and two-way traffic managed,

b. On a four lane road sections, two lanes (one in each direction) be open at all times,

c. Complete temporary pre-marking of the pavement marking plan, laid out on all new asphalt at the end of each construction day

d. Maintain all traffic signing (by the Contractor) throughout the duration of the project

e. Complete a pavement marking and traffic signing inventory (by the contractor) before and after the project and subsequent re-installation

f. Complete all required sidewalks, turn lanes, traffic islands, traffic signals, pavement marking, traffic signing and associated works/restoration prior to opening a facility to the public.

g. Detour Maintenance Plan that will ensure the quality of the temporary riding surface. Specifically, this shall detail

   i. If Hot Mix Asphalt: the type of asphalt, thickness of asphalt, smoothness of surface layer, frequency of cleaning, and any provision for emergency pothole repair in the detour.

   ii. If Gravel surface: The type of granular to be placed, the amount of compaction, the smoothness of the surface layer, frequency of maintenance and any provision for emergency grading (grader on site or standby), frequency of calcium to be added for dust suppression

h. A site-specific paving schedule that will detail the Contractor's paving schedule to ensure than on any of the roadway or portion thereof that is open to the public that all vertical deflections in the pavement are reduced to less than 10mm. This plan should include the contractor's plans to place temporary asphalt, milling out of temporary asphalt and final paving.

i. In unique circumstances, alternative solutions will be considered for approval by the Director of Transportation.

2.6.2.6. Detour Plans

Detour plans must be authorized through the Transportation Planning and Design Division, two weeks prior to construction. Signs will be placed by the Contractor's own forces.

2.6.2.7. Traffic Control Plan

Traffic Control plans must be submitted to Transportation for acceptance.

2.6.2.8. Pedestrian Safety

Construction Projects in proximity to high pedestrian areas, including schools, commercial areas and any other source of high pedestrian volumes should take extra precaution to separate construction activity from pedestrian movements.

Sidewalks that are closed or removed should have signed alternate detour routes. Pedestrian paths of travel impacts must be addressed in accordance with AODA. If it is not possible to retain a smooth hard-surface sidewalk, appropriate closure and pedestrian detour signage is required identifying an AODA compliant path of travel. Impactful closures where reasonable detours are not available require informational signage placed for a 2-week period prior to the event in combination with identification on Renew London.

Any material deliveries or construction vehicle movements crossing pedestrian areas should be carefully monitored by a traffic control person.

Schools in close proximity to projects should be notified in the preconstruction letters and kept informed of progress.

2.6.2.9. Cyclist Safety

Construction projects along designated cycling routes shall include signage and considerations discussed in OTM Book 7 & 18. Long duration projects should be discussed with Transportation Planning and Design (TP&D) in advance to come to an acceptable temporary solution.

2.7. Transportation Figures

The following figures are to be when designing roads in the City of London.

Figure 2.1 Minimum Centerline Radii of Curvature of Roads in Subdivisions

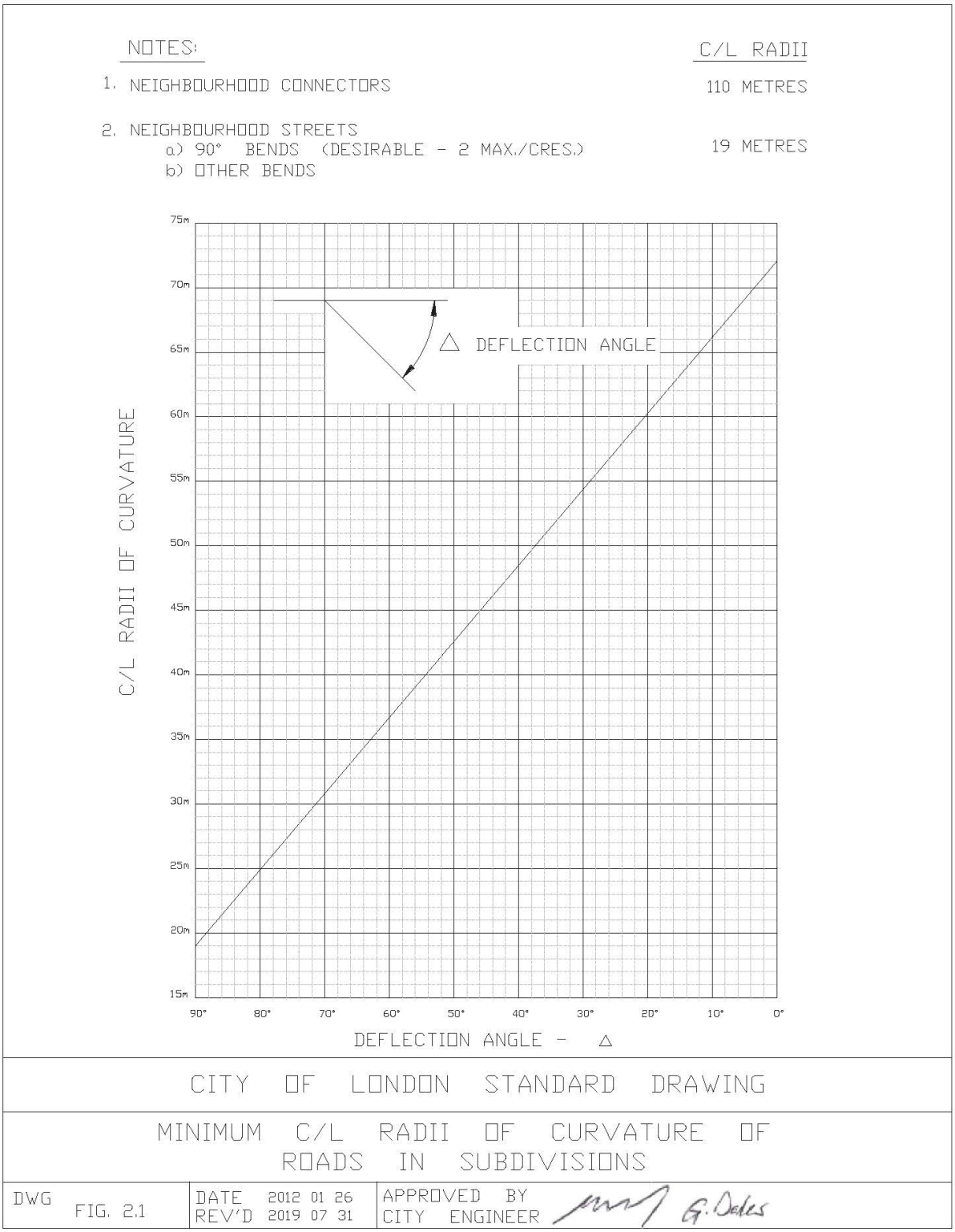


Figure 2.1.22 Concrete Bus Bay

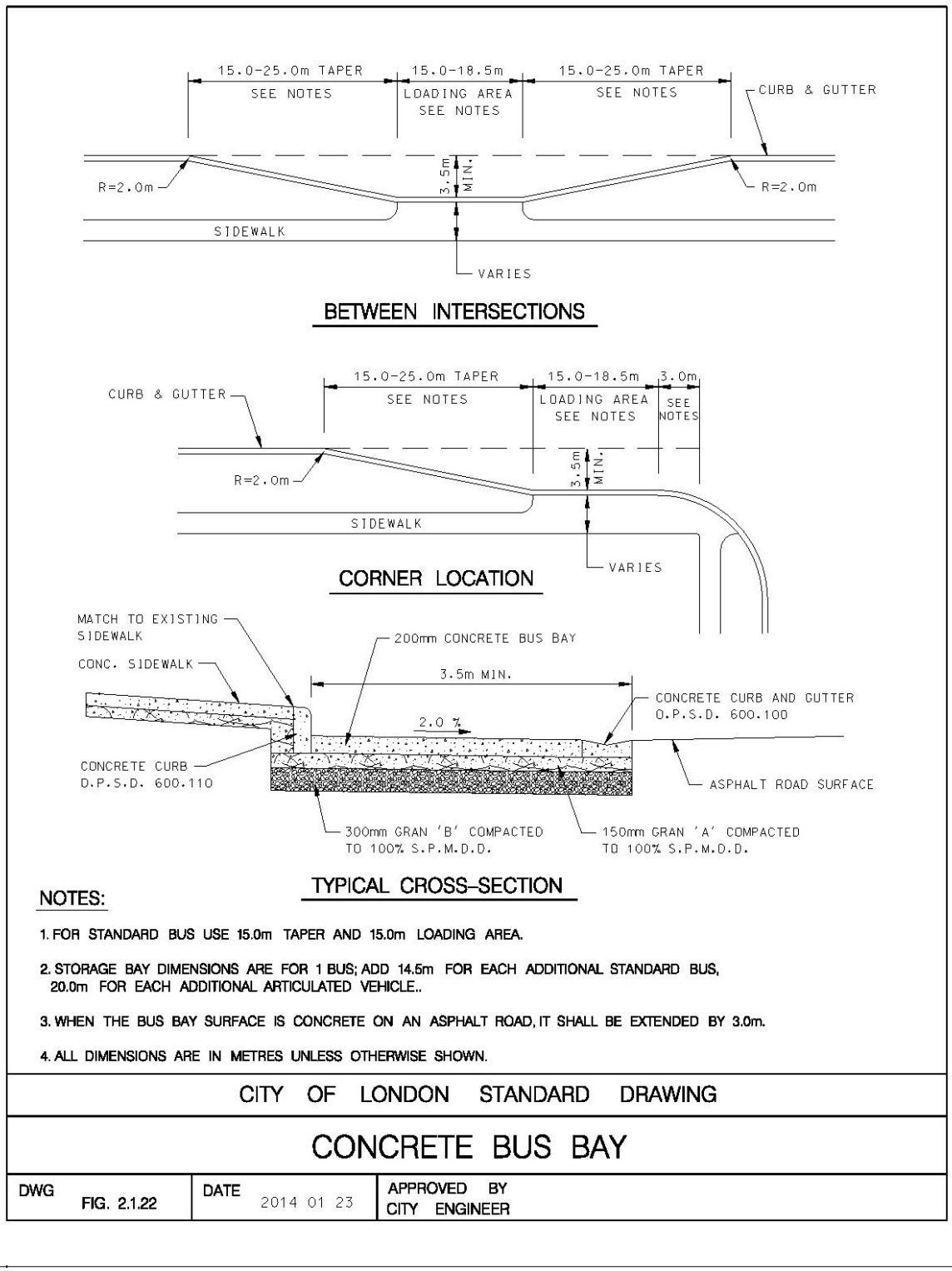
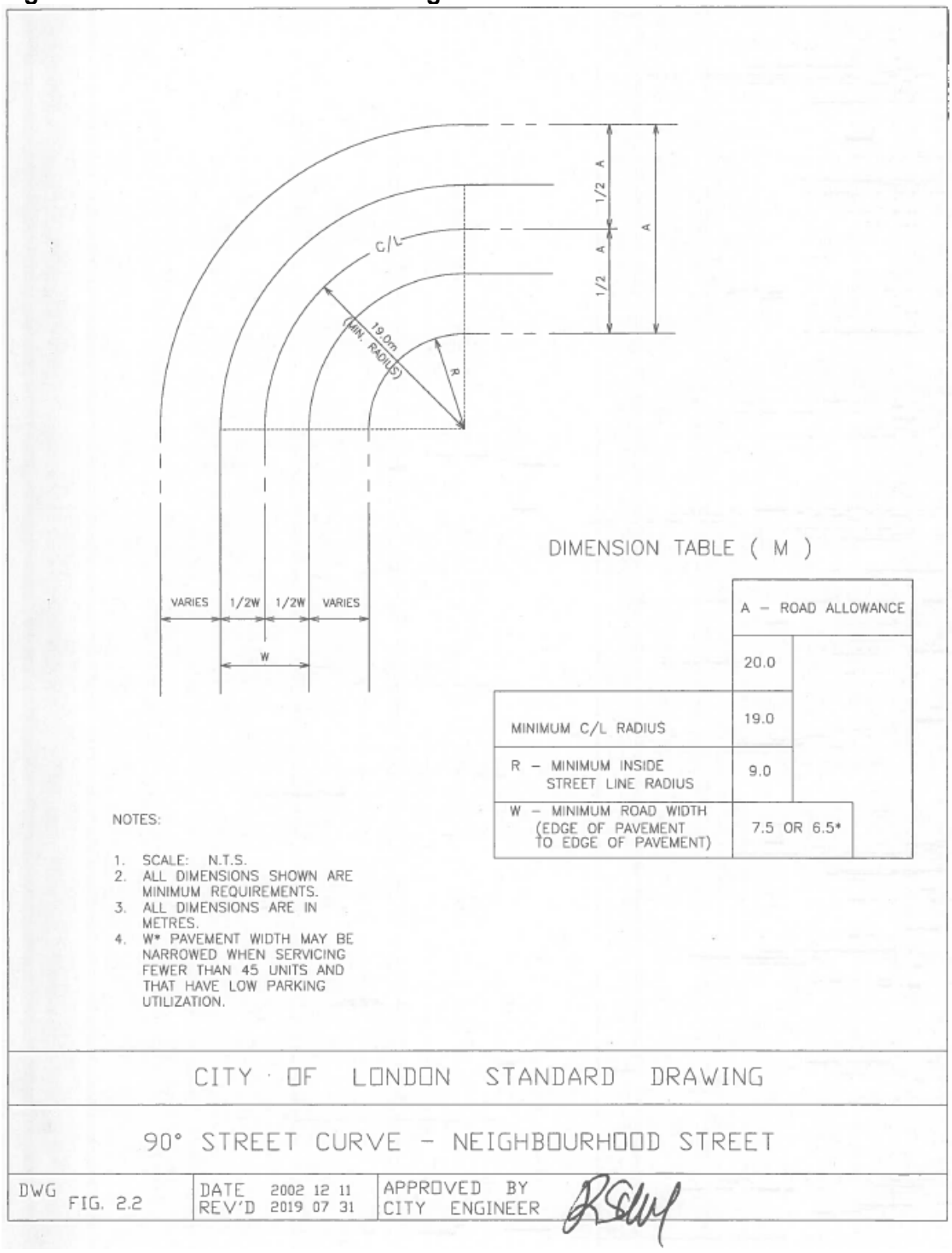


Figure 2.2 90° Street Curve – Neighbourhood Street



DIMENSION TABLE (M)

	A – ROAD ALLOWANCE
	20.0
MINIMUM C/L RADIUS	19.0
R – MINIMUM INSIDE STREET LINE RADIUS	9.0
W – MINIMUM ROAD WIDTH (EDGE OF PAVEMENT TO EDGE OF PAVEMENT)	7.5 OR 6.5*

NOTES:

1. SCALE: N.T.S.
2. ALL DIMENSIONS SHOWN ARE MINIMUM REQUIREMENTS.
3. ALL DIMENSIONS ARE IN METRES.
4. W* PAVEMENT WIDTH MAY BE NARROWED WHEN SERVICING FEWER THAN 45 UNITS AND THAT HAVE LOW PARKING UTILIZATION.

CITY OF LONDON STANDARD DRAWING

90° STREET CURVE – NEIGHBOURHOOD STREET

DWG	DATE	APPROVED BY
FIG. 2.2	2002 12 11 REV'D 2019 07 31	CITY ENGINEER

Figure 2.3 Curb Extension & Reduced Radius

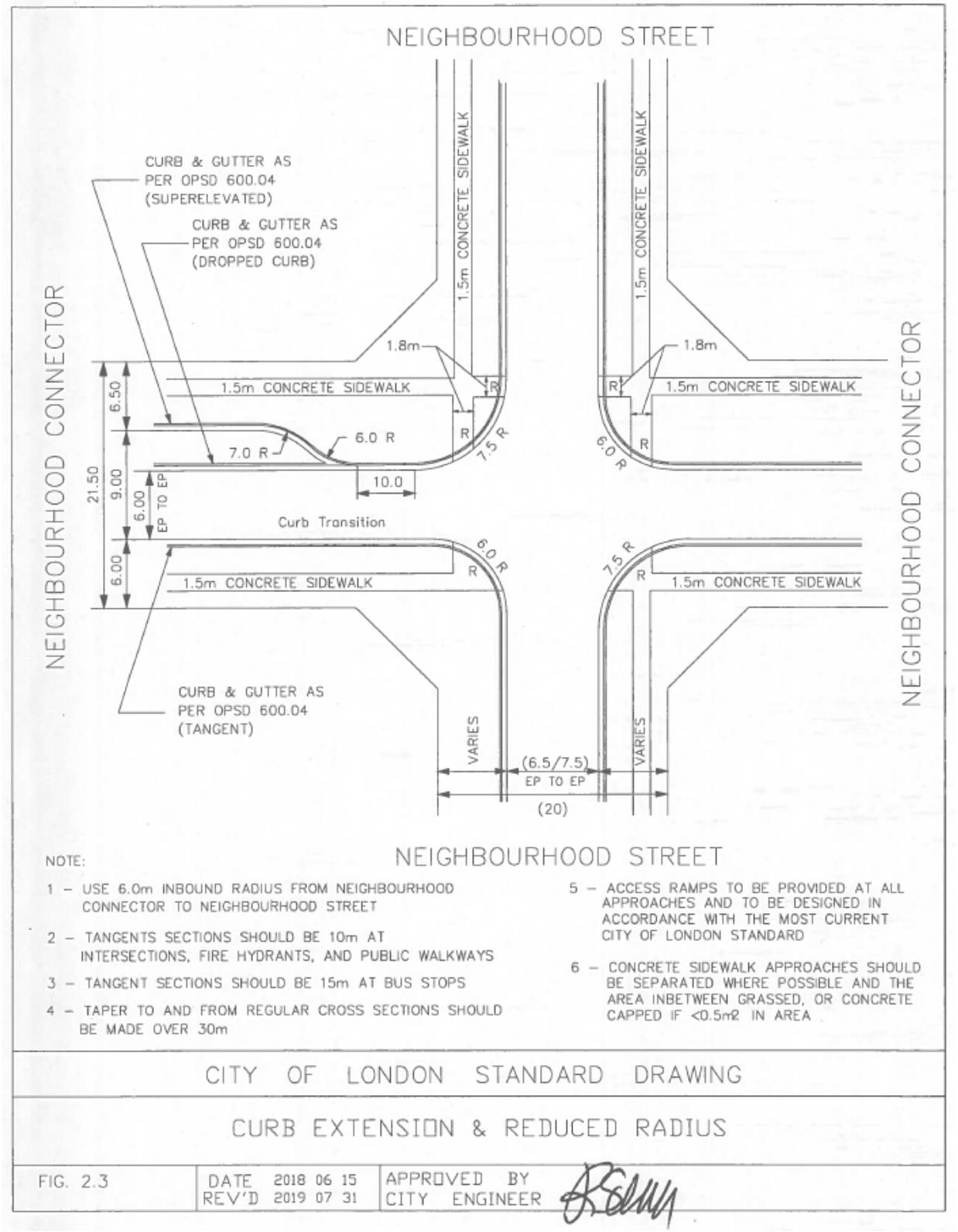


Figure 2.3.1 Street Name Signing

Figure 2.3.2 Raised Concrete Intersection Design

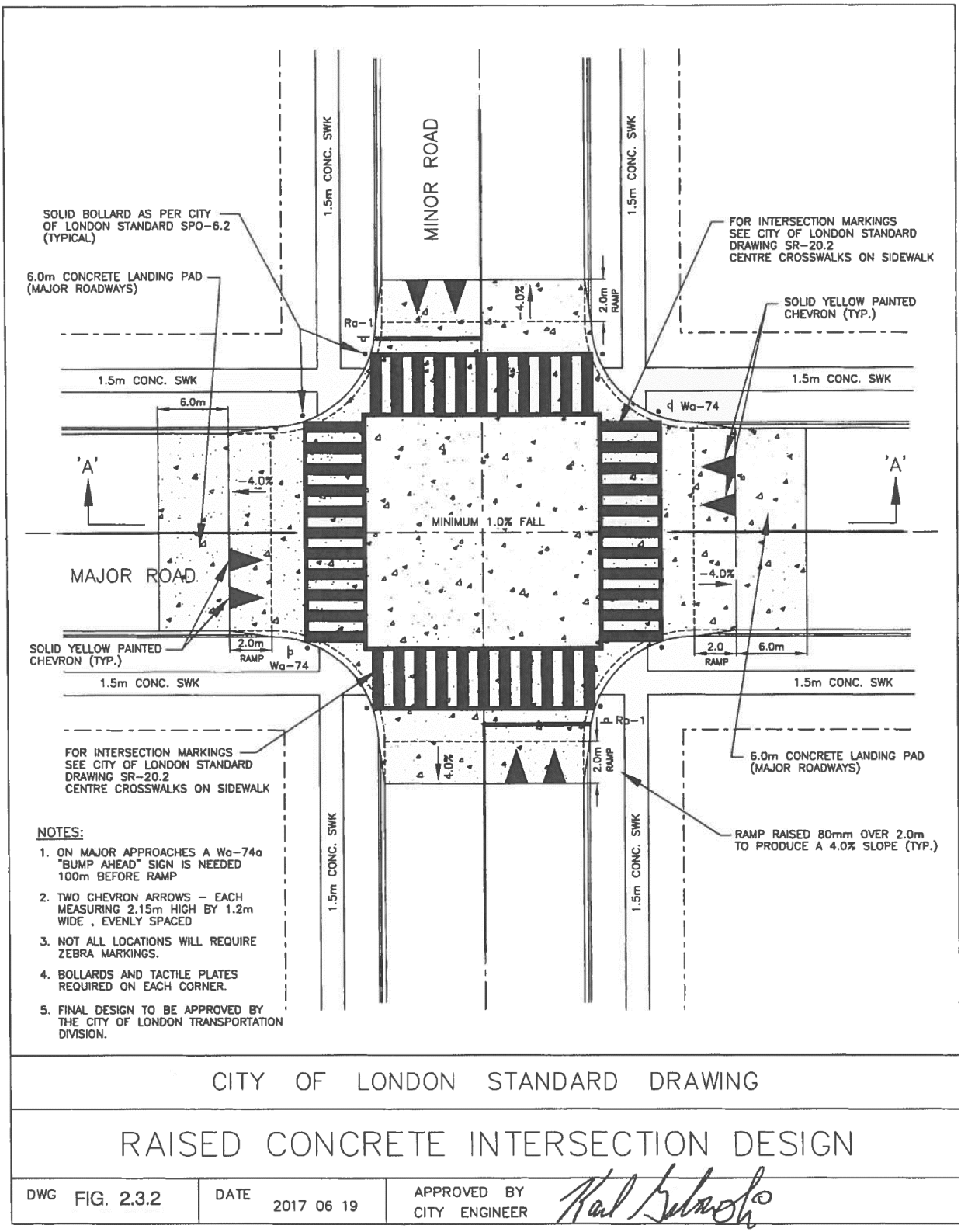


Figure 2.3.2A Raised Concrete Intersection Detail - Cross-Section

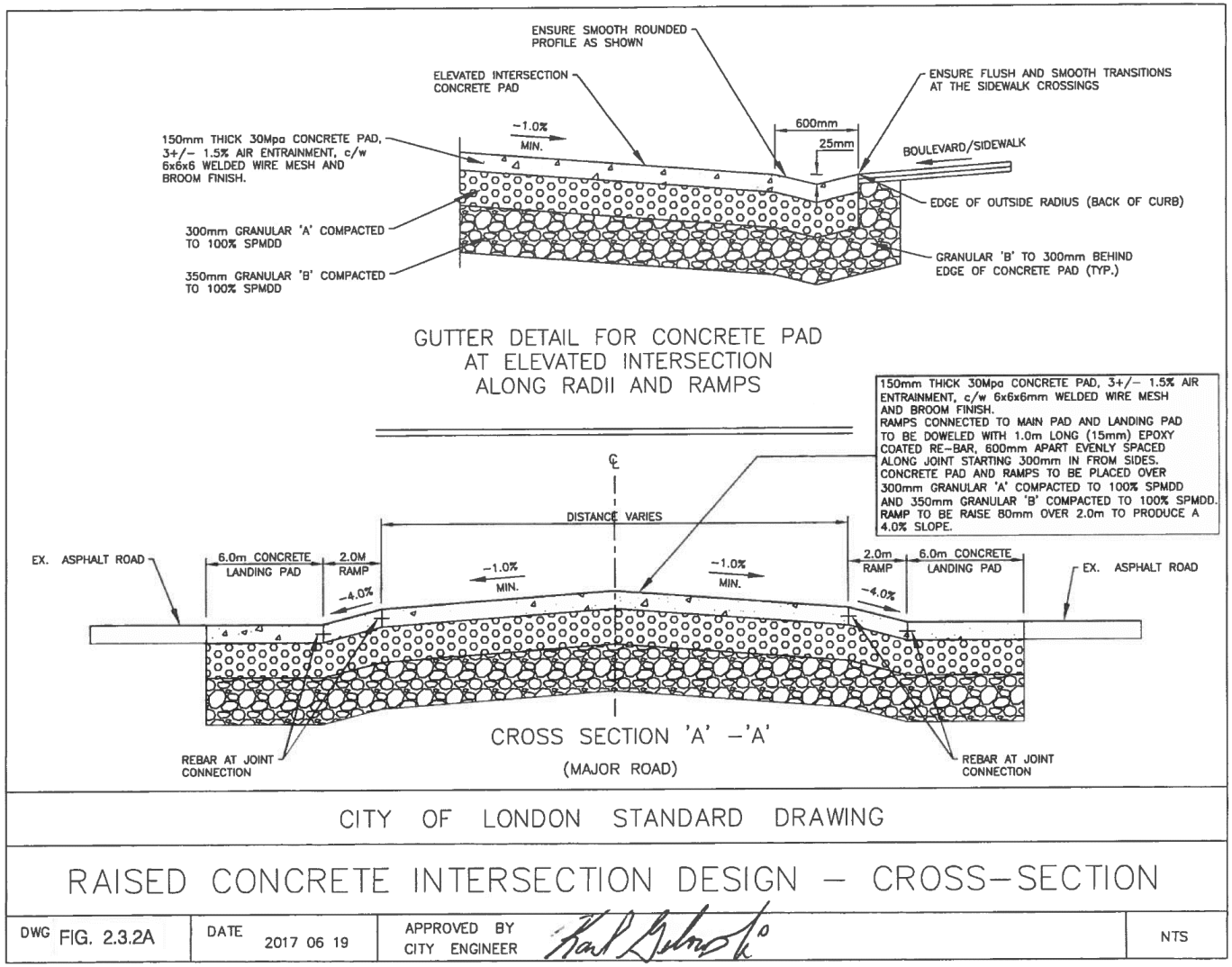
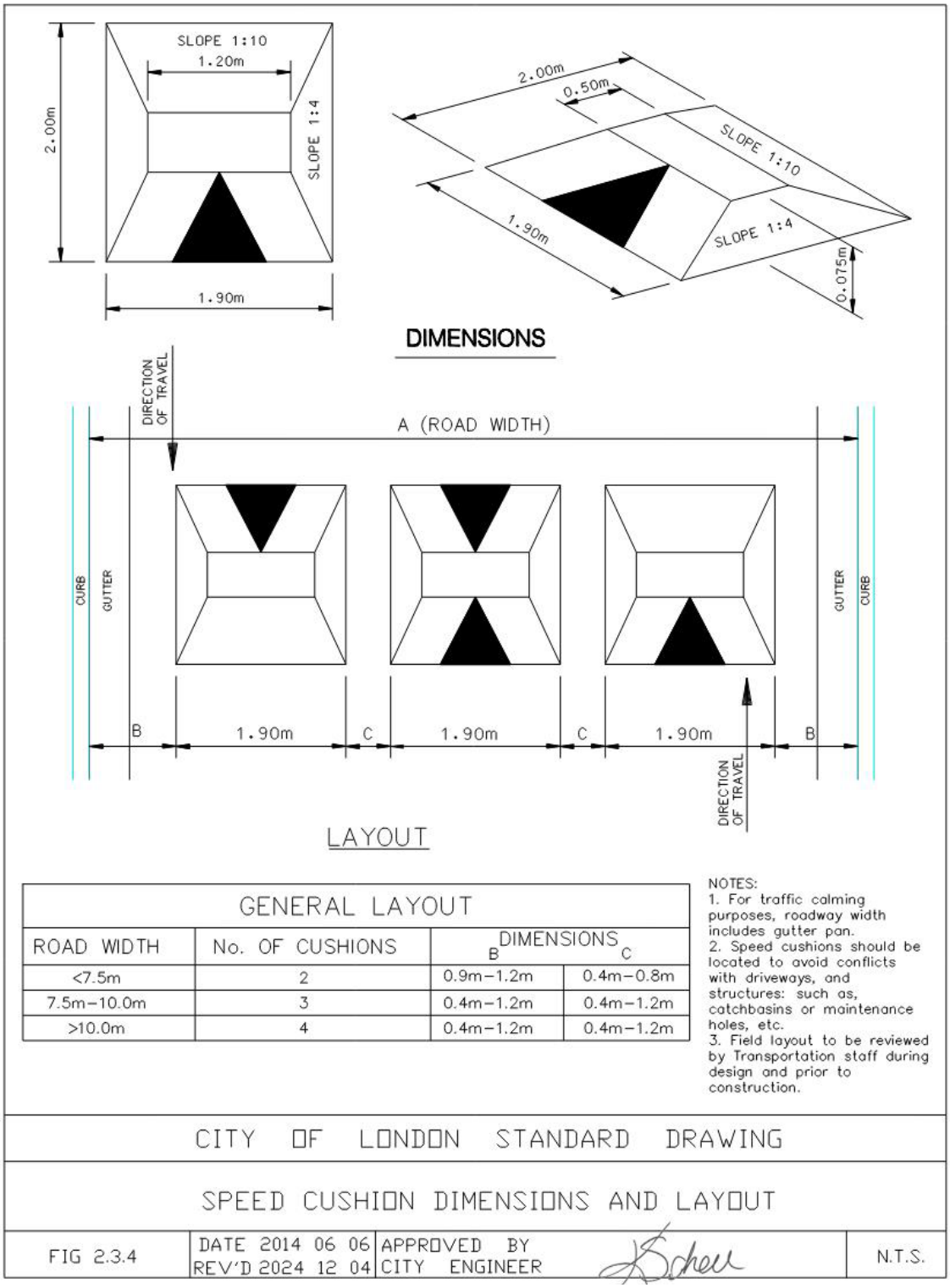


Figure 2.3.4 Speed Cushion Design



GENERAL LAYOUT			
ROAD WIDTH	No. OF CUSHIONS	DIMENSIONS B	DIMENSIONS C
<7.5m	2	0.9m–1.2m	0.4m–0.8m
7.5m–10.0m	3	0.4m–1.2m	0.4m–1.2m
>10.0m	4	0.4m–1.2m	0.4m–1.2m

NOTES:
1. For traffic calming purposes, roadway width includes gutter pan.
2. Speed cushions should be located to avoid conflicts with driveways, and structures: such as, catchbasins or maintenance holes, etc.
3. Field layout to be reviewed by Transportation staff during design and prior to construction.

CITY OF LONDON STANDARD DRAWING

SPEED CUSHION DIMENSIONS AND LAYOUT

FIG 2.3.4	DATE 2014 06 06 REV'D 2024 12 04	APPROVED BY CITY ENGINEER	N.T.S.

Figure 2.3.10 Pedestrian Refugee Island

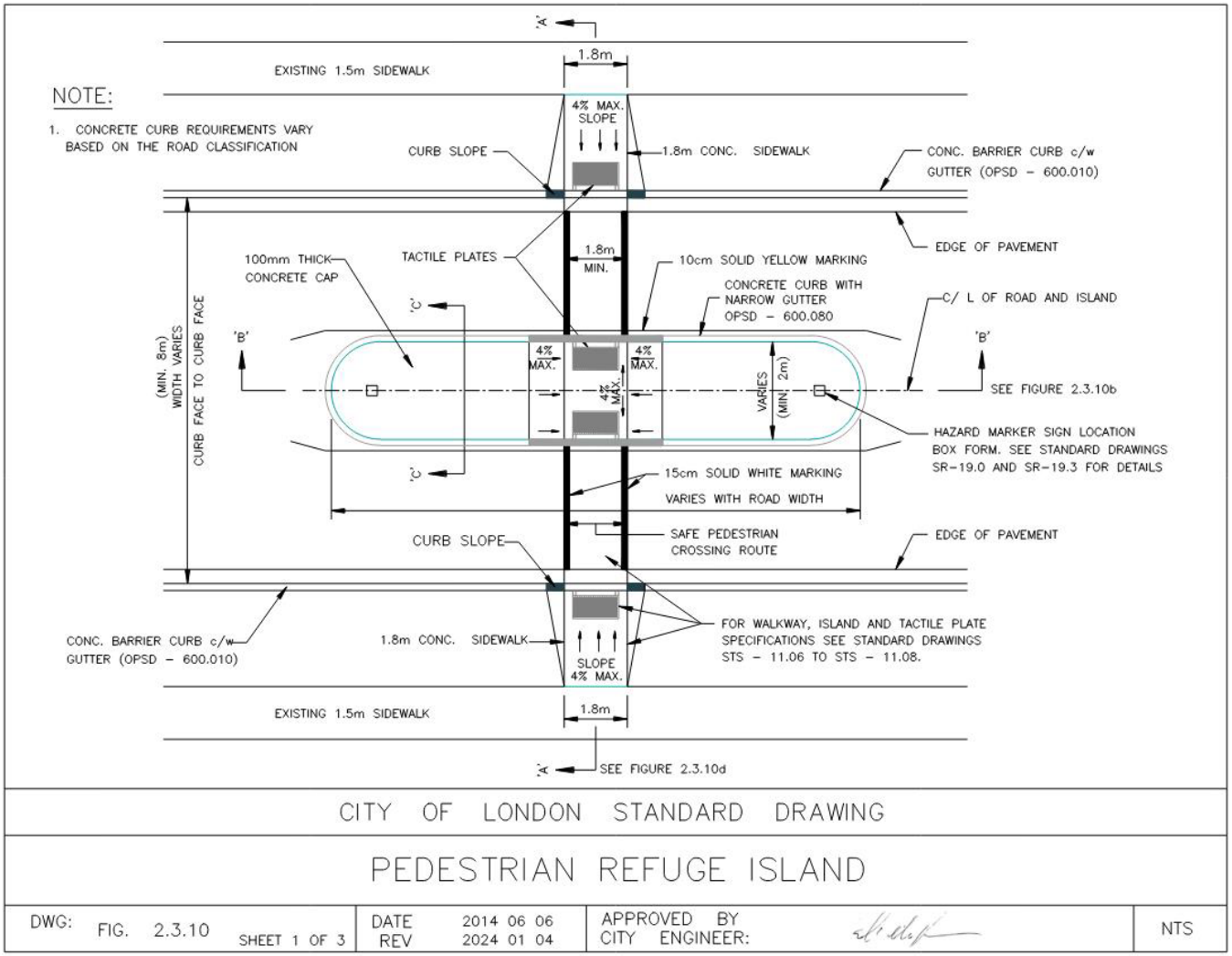


Figure 2.3.10A Pedestrian Refugee Island – Sections

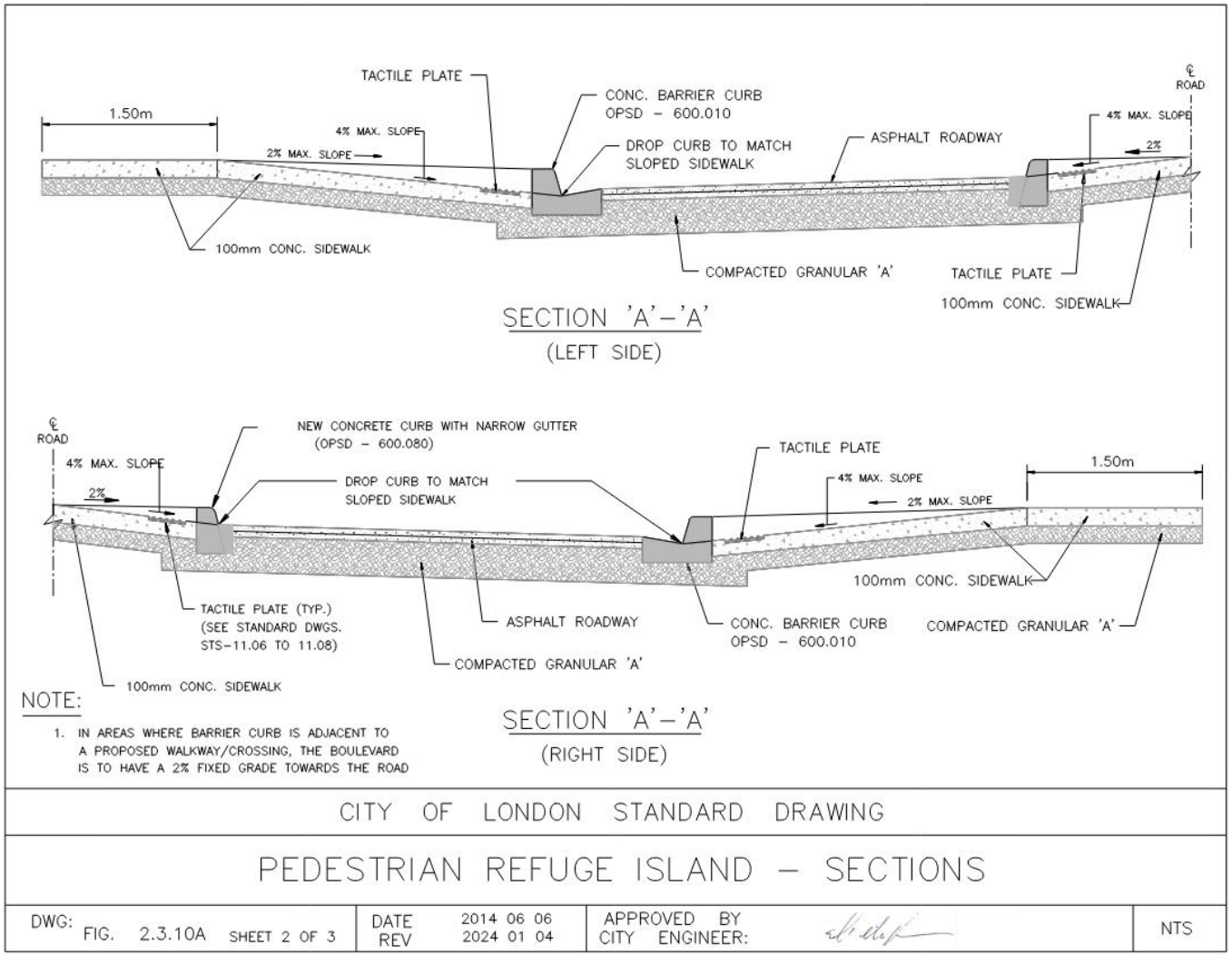


Figure 2.3.10B Pedestrian Refugee Island – Sections

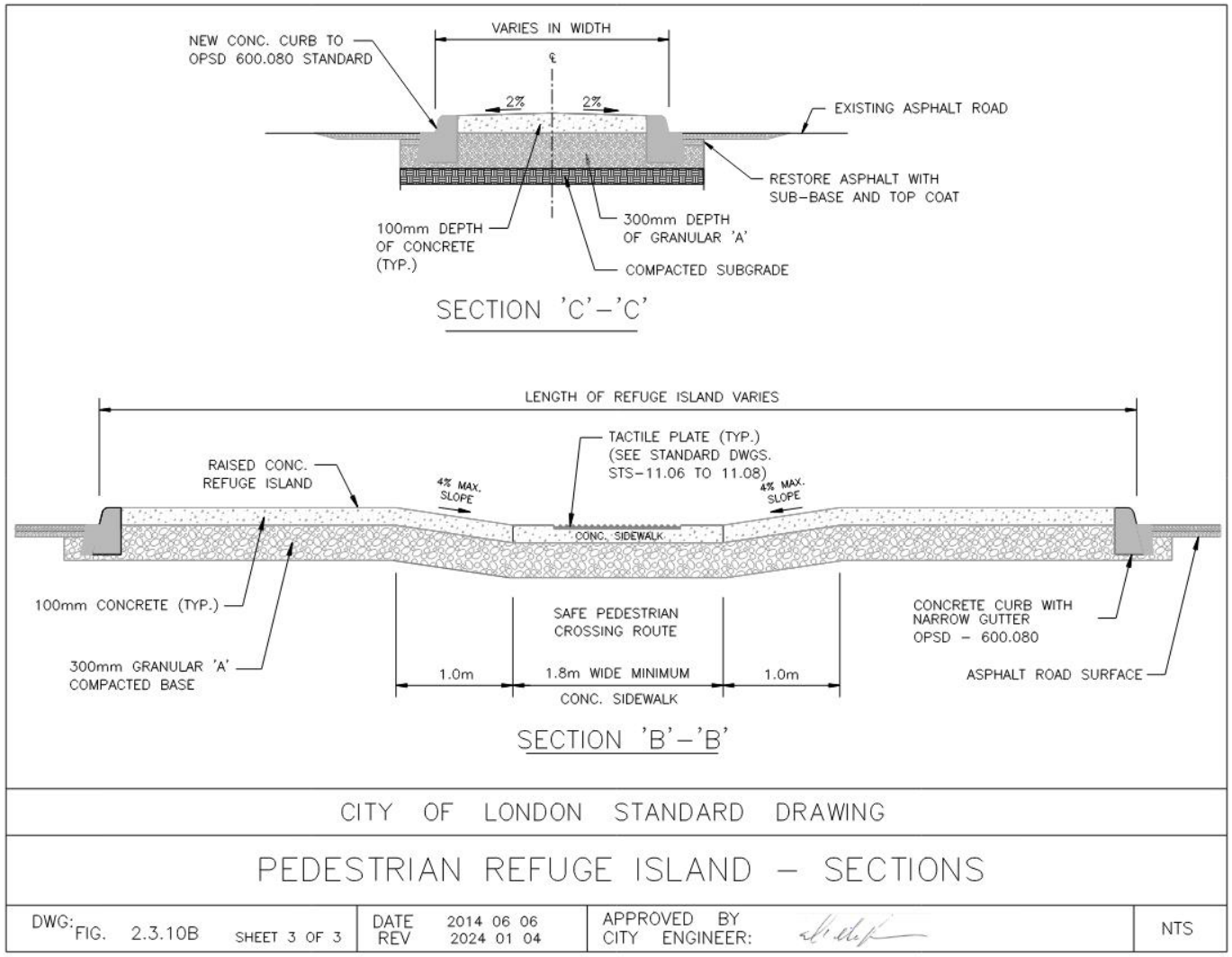


Figure 2.3.12 Raised Pedestrian Crosswalk

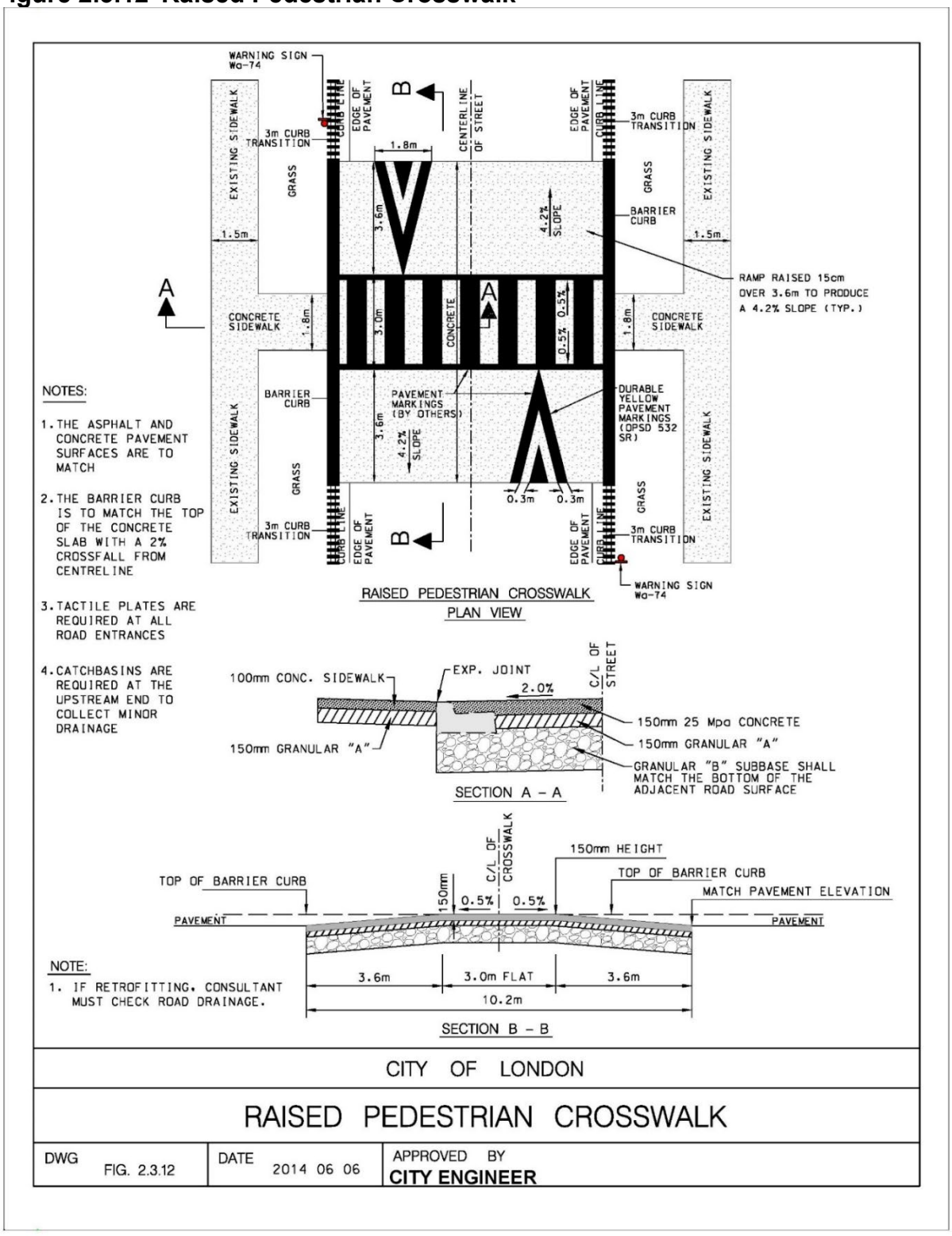


Figure 2.5 Roundabout 17.0m Radius (Neighbourhood Connector / Neighbourhood Connector)

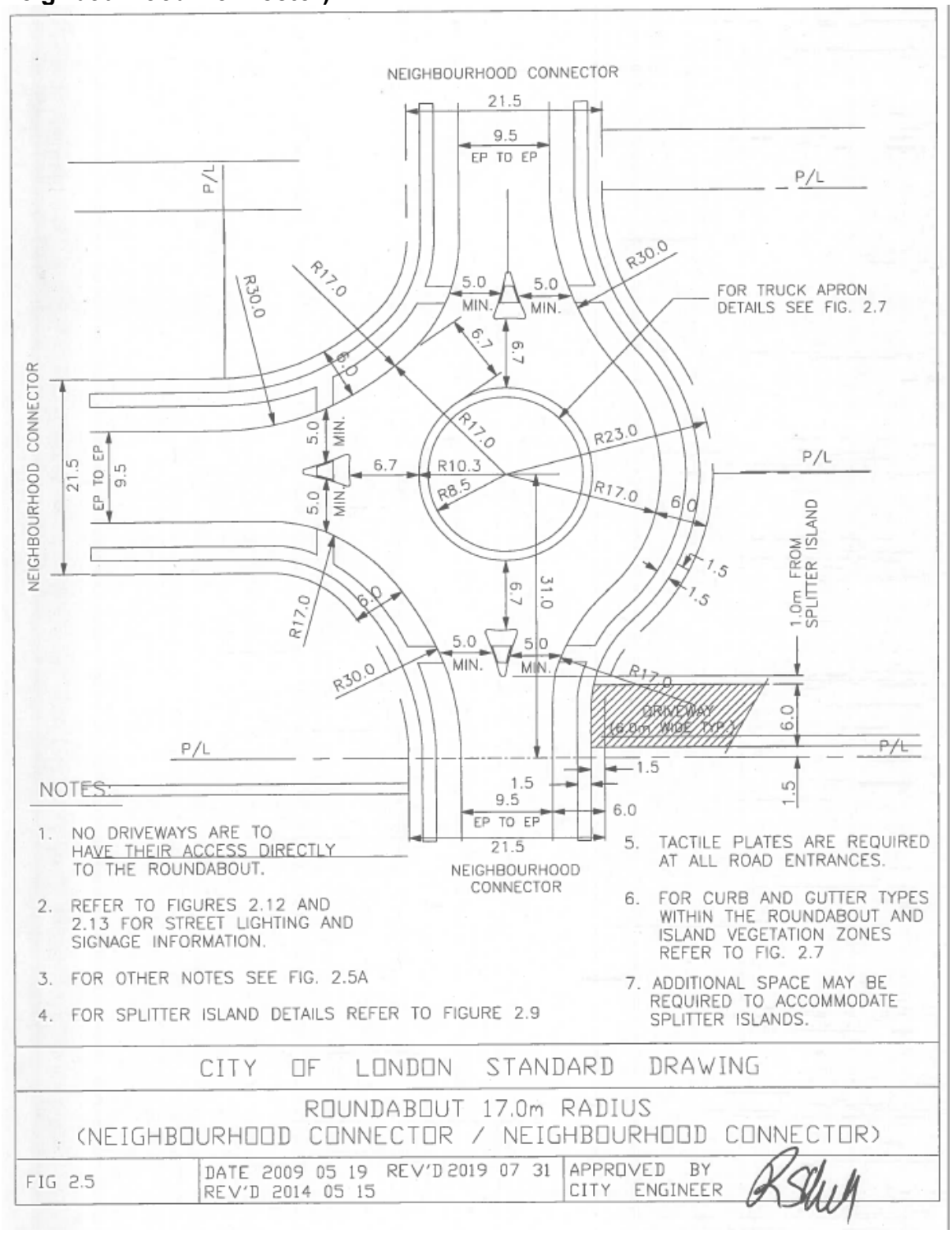
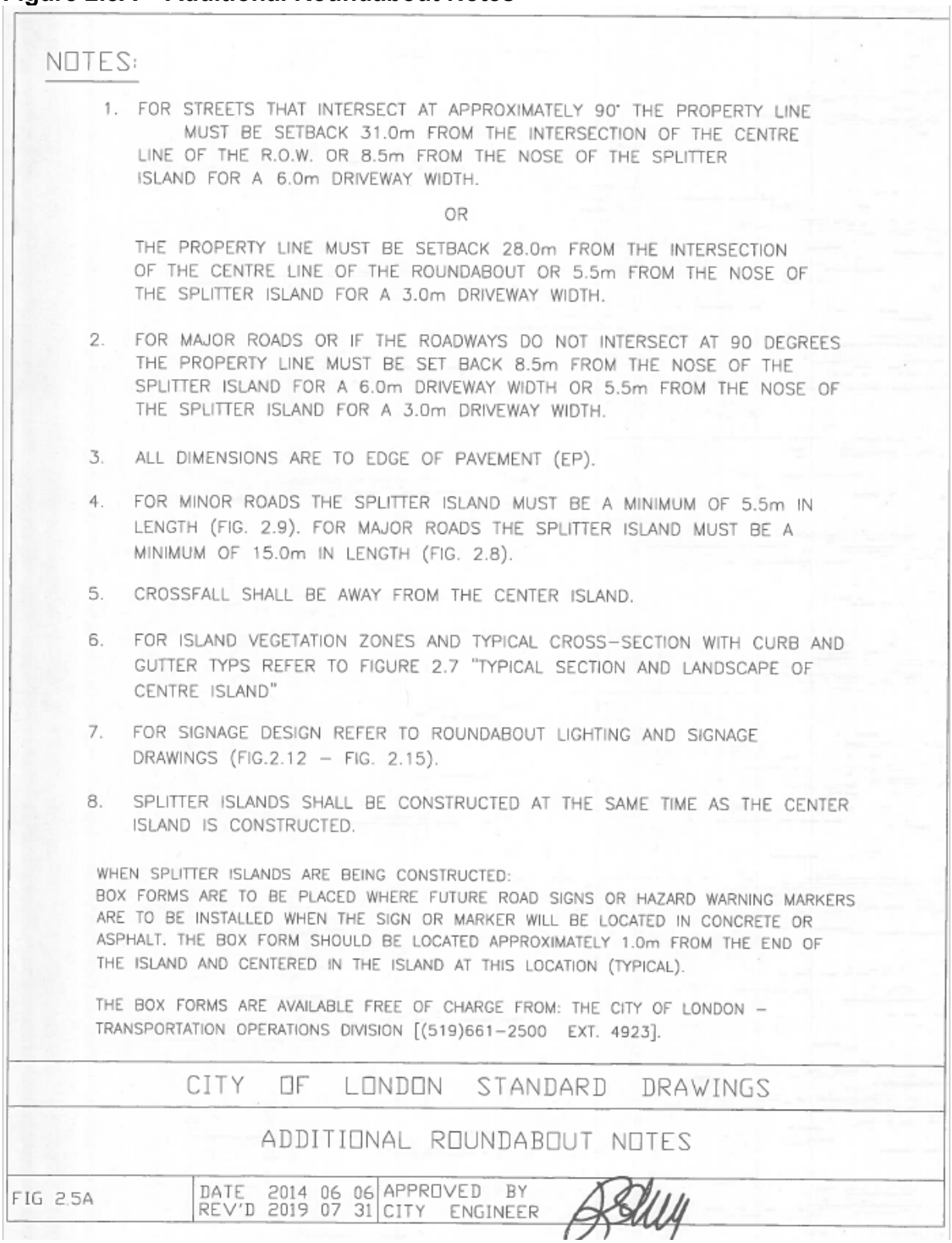


Figure 2.5A Additional Roundabout Notes



NOTES:

1. FOR STREETS THAT INTERSECT AT APPROXIMATELY 90° THE PROPERTY LINE MUST BE SETBACK 31.0m FROM THE INTERSECTION OF THE CENTRE LINE OF THE R.O.W. OR 8.5m FROM THE NOSE OF THE SPLITTER ISLAND FOR A 6.0m DRIVEWAY WIDTH.

   OR

   THE PROPERTY LINE MUST BE SETBACK 28.0m FROM THE INTERSECTION OF THE CENTRE LINE OF THE ROUNDABOUT OR 5.5m FROM THE NOSE OF THE SPLITTER ISLAND FOR A 3.0m DRIVEWAY WIDTH.

2. FOR MAJOR ROADS OR IF THE ROADWAYS DO NOT INTERSECT AT 90 DEGREES THE PROPERTY LINE MUST BE SET BACK 8.5m FROM THE NOSE OF THE SPLITTER ISLAND FOR A 6.0m DRIVEWAY WIDTH OR 5.5m FROM THE NOSE OF THE SPLITTER ISLAND FOR A 3.0m DRIVEWAY WIDTH.

3. ALL DIMENSIONS ARE TO EDGE OF PAVEMENT (EP).

4. FOR MINOR ROADS THE SPLITTER ISLAND MUST BE A MINIMUM OF 5.5m IN LENGTH (FIG. 2.9). FOR MAJOR ROADS THE SPLITTER ISLAND MUST BE A MINIMUM OF 15.0m IN LENGTH (FIG. 2.8).

5. CROSSFALL SHALL BE AWAY FROM THE CENTER ISLAND.

6. FOR ISLAND VEGETATION ZONES AND TYPICAL CROSS-SECTION WITH CURB AND GUTTER TYPS REFER TO FIGURE 2.7 "TYPICAL SECTION AND LANDSCAPE OF CENTRE ISLAND"

7. FOR SIGNAGE DESIGN REFER TO ROUNDABOUT LIGHTING AND SIGNAGE DRAWINGS (FIG.2.12 – FIG. 2.15).

8. SPLITTER ISLANDS SHALL BE CONSTRUCTED AT THE SAME TIME AS THE CENTER ISLAND IS CONSTRUCTED.

WHEN SPLITTER ISLANDS ARE BEING CONSTRUCTED:
BOX FORMS ARE TO BE PLACED WHERE FUTURE ROAD SIGNS OR HAZARD WARNING MARKERS ARE TO BE INSTALLED WHEN THE SIGN OR MARKER WILL BE LOCATED IN CONCRETE OR ASPHALT. THE BOX FORM SHOULD BE LOCATED APPROXIMATELY 1.0m FROM THE END OF THE ISLAND AND CENTERED IN THE ISLAND AT THIS LOCATION (TYPICAL).

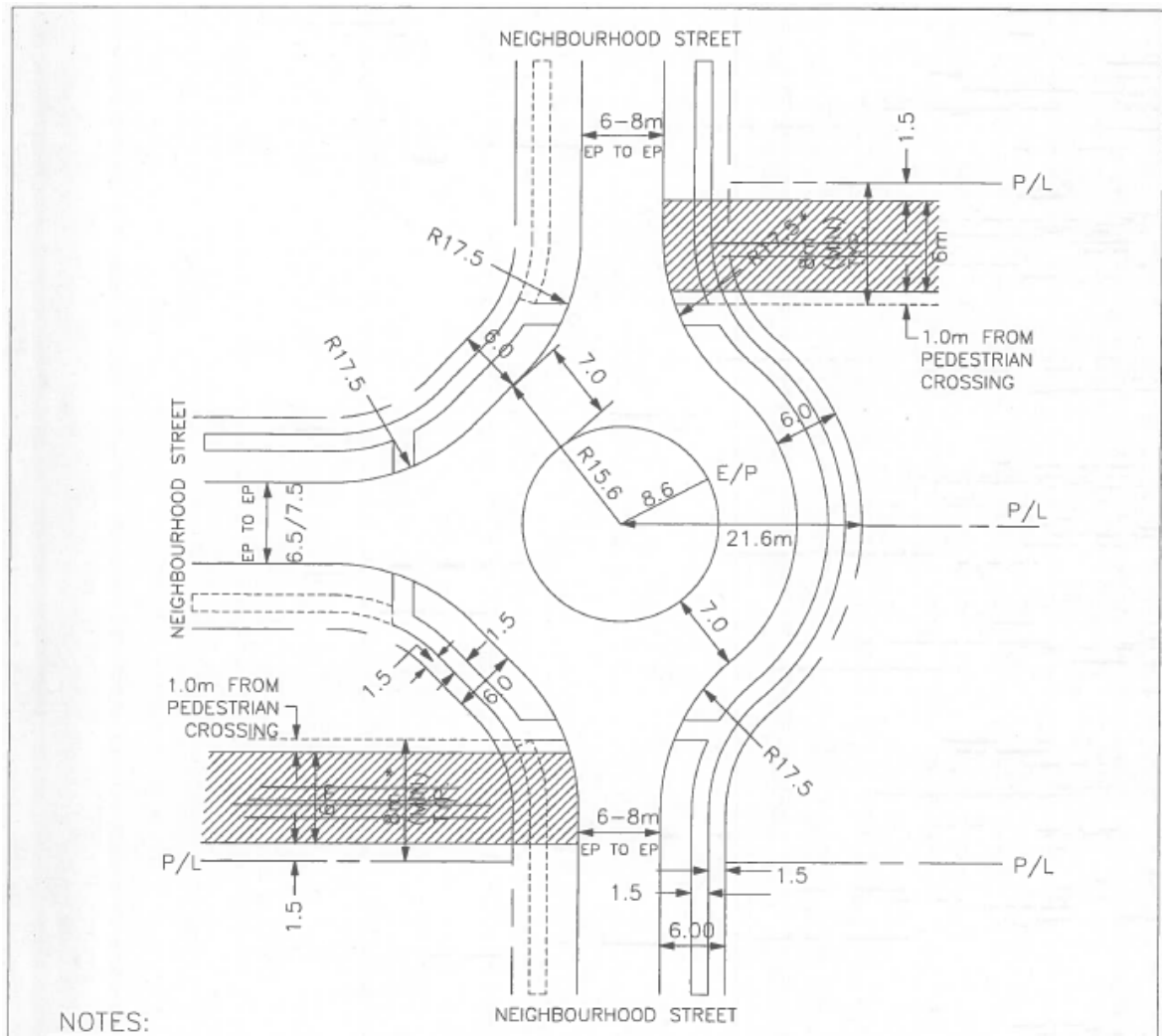
THE BOX FORMS ARE AVAILABLE FREE OF CHARGE FROM: THE CITY OF LONDON – TRANSPORTATION OPERATIONS DIVISION [(519)661-2500 EXT. 4923].

CITY OF LONDON STANDARD DRAWINGS

ADDITIONAL ROUNDABOUT NOTES

FIG 2.5A	DATE 2014 06 06 REV'D 2019 07 31	APPROVED BY CITY ENGINEER

Figure 2.6 Roundabout 15.6m Radius (Neighbourhood Street / Neighbourhood Street)

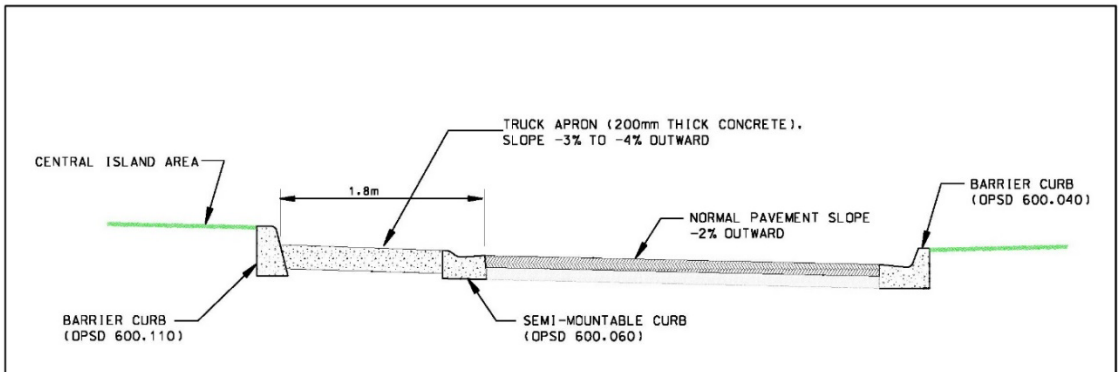


NOTES:

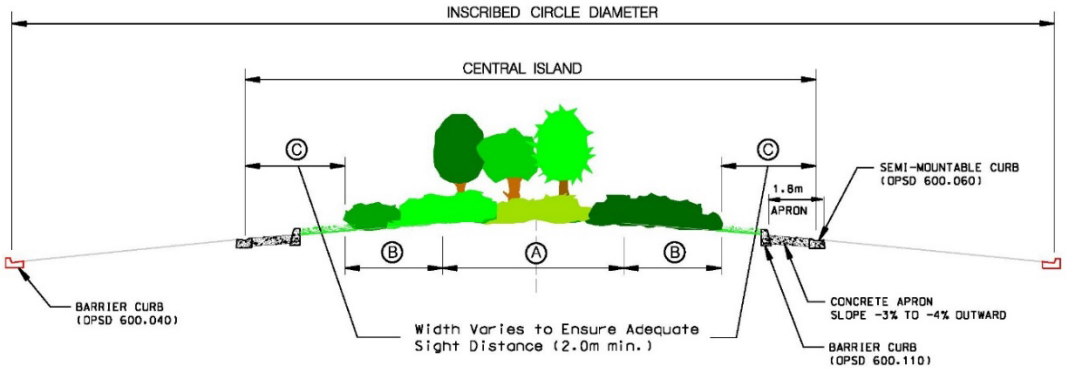
1. FOR CURB AND GUTTER TYPES WITHIN THE ROUNDABOUT AND ISLAND VEGETATION ZONES REFER TO FIGURE 2.7.
2. CROSSFALL SHALL BE AWAY FROM CENTRE ISLAND.
3. SIDEWALKS ARE REQUIRED ON ALL SIDES OF THE ROUNDABOUT.
4. REFER TO SECTION 2.1.15 FOR NUMBER AND LOCATION OF SIDEWALKS ON NEIGHBOURHOOD STREETS
5. NO DRIVEWAYS ARE TO HAVE THEIR ACCESS DIRECTLY TO THE ROUNDABOUT.
6. REFER TO FIGURES 2.14 AND 2.15 FOR STREET LIGHTING AND SIGNAGE INFORMATION.
7. TACTILE PLATES ARE REQUIRED AT ALL ROAD ENTRANCES.

CITY OF LONDON STANDARD DRAWINGS		
ROUNDABOUT 15.6m RADIUS (NEIGHBOURHOOD STREET/NEIGHBOURHOOD STREET)		
FIG 2.6	DATE 2009 05 19 REV'D 2014 05 15 REV'D 2019 07 31	APPROVED BY CITY ENGINEER

Figure 2.7 Typical Section and Landscaping of Center Island



TYPICAL SECTION WITH A TRUCK APRON



ISLAND VEGETATION ZONES				
	17m ROUNDABOUT		15.6m ROUNDABOUT	
Ⓐ	0–5m	UNRESTRICTED HEIGHT	0–4m	UNRESTRICTED HEIGHT
Ⓑ	>5–8.3m	1.0m MAX. HEIGHT	>4–6m	1.0m MAX. HEIGHT
Ⓒ	>8.3–10.3m	0.3m MAX. HEIGHT	>6–8m	0.3m MAX. HEIGHT

LANDSCAPING OF THE CENTRAL ISLAND

CITY OF LONDON

TYPICAL SECTION AND LANDSCAPING OF CENTRAL ISLAND

FIG. 2.7	DATE 2014 06 06	APPROVED BY CITY ENGINEER

Figure 2.8 15.0m Splitter Island Design (Major Road / Neighbourhood Connector)

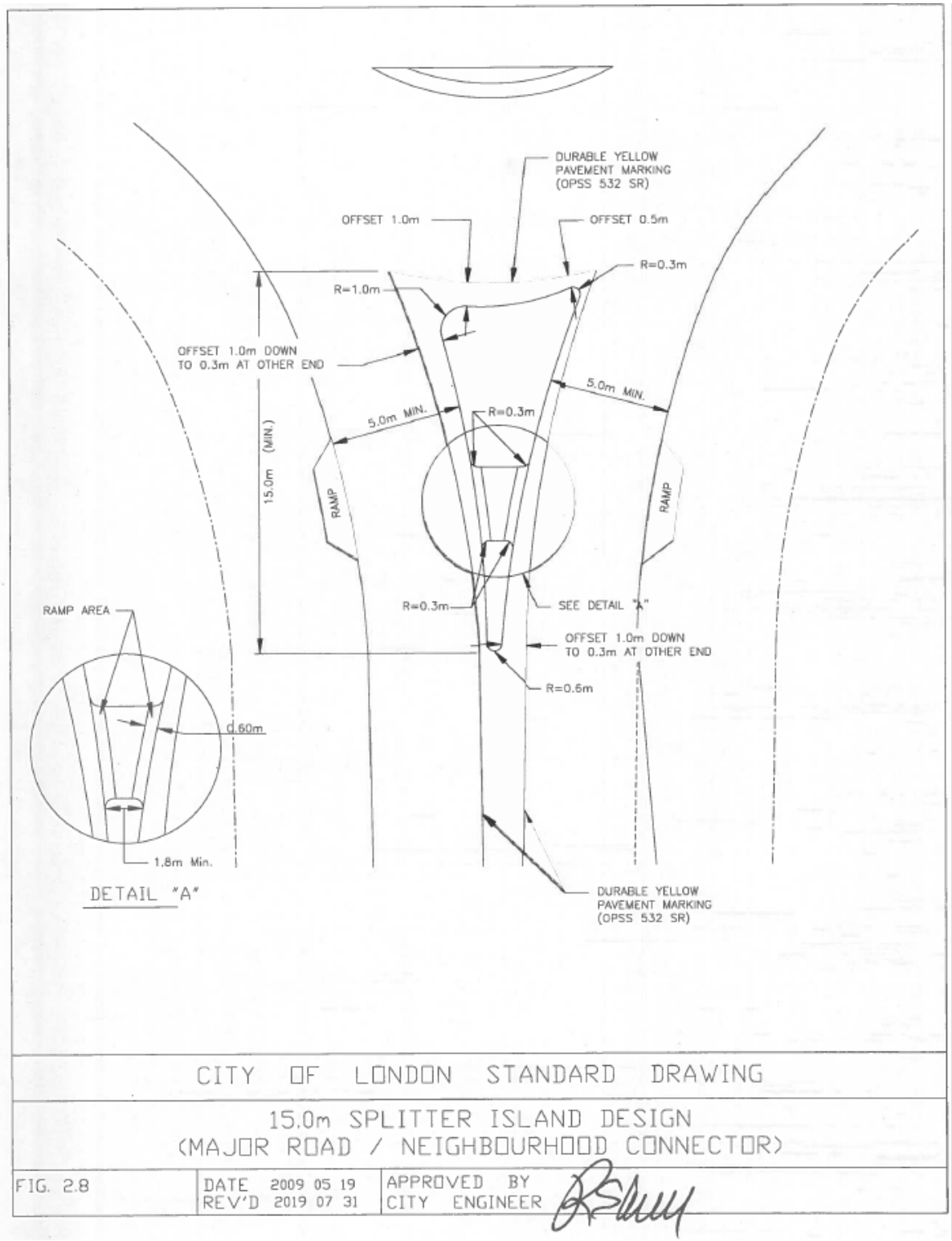


Figure 2.9 5.5m Splitter Island Design (Neighbourhood Connector / Neighbourhood Street)

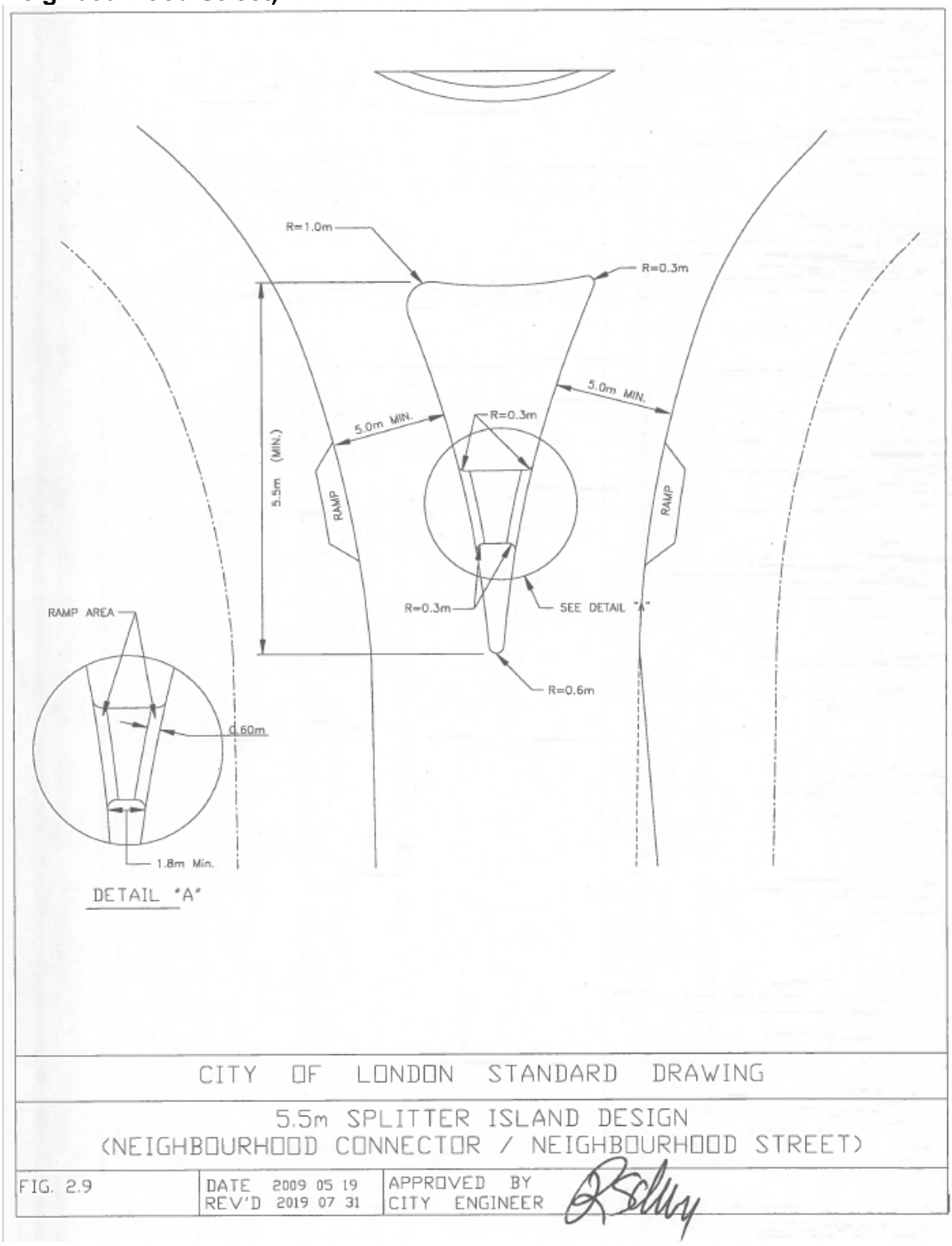


Figure 2.10 Roundabout Approach with Bike Lanes

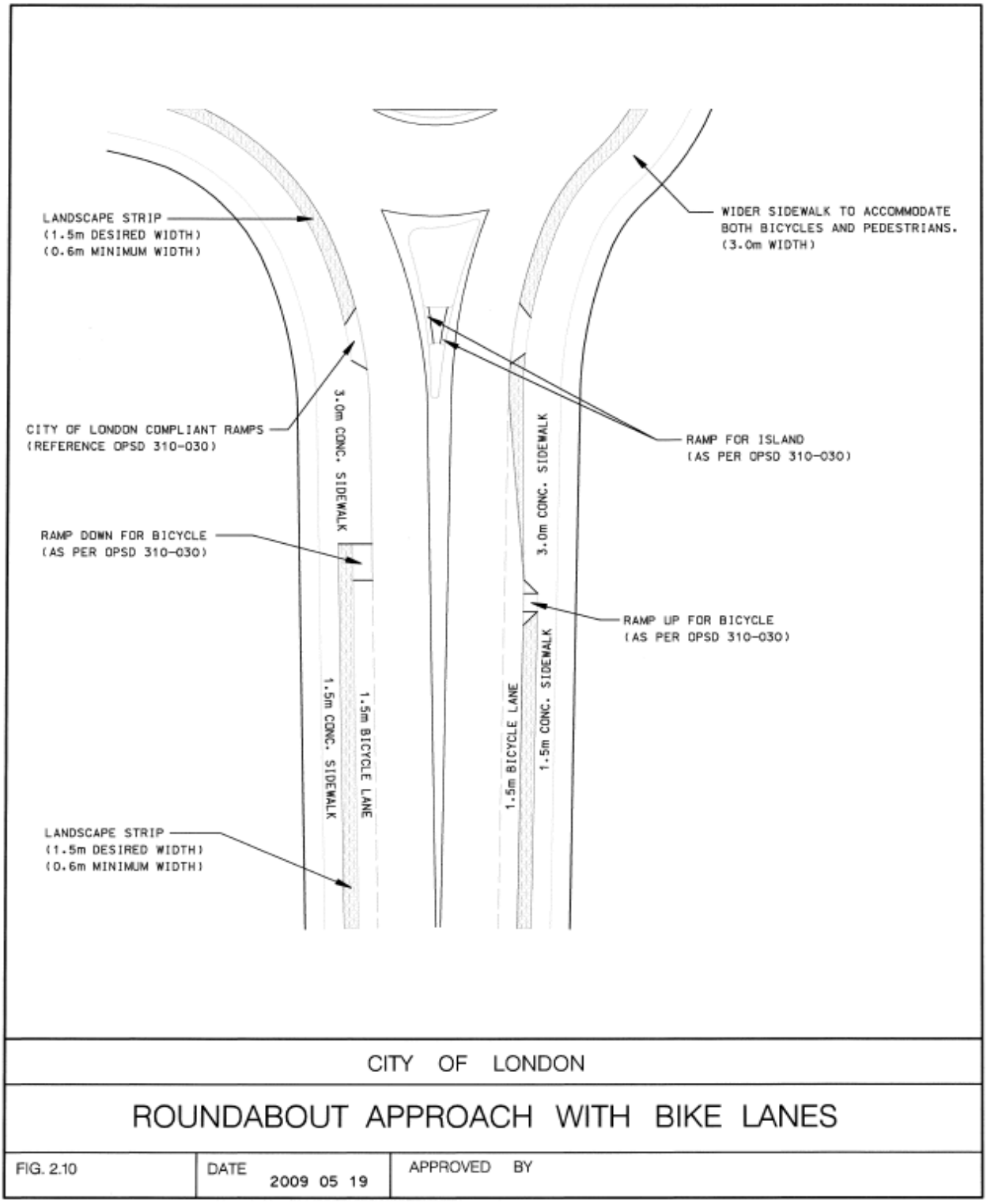


Figure 2.12 Roundabout 17.0m Radius – Signage (3-Leg Intersection)

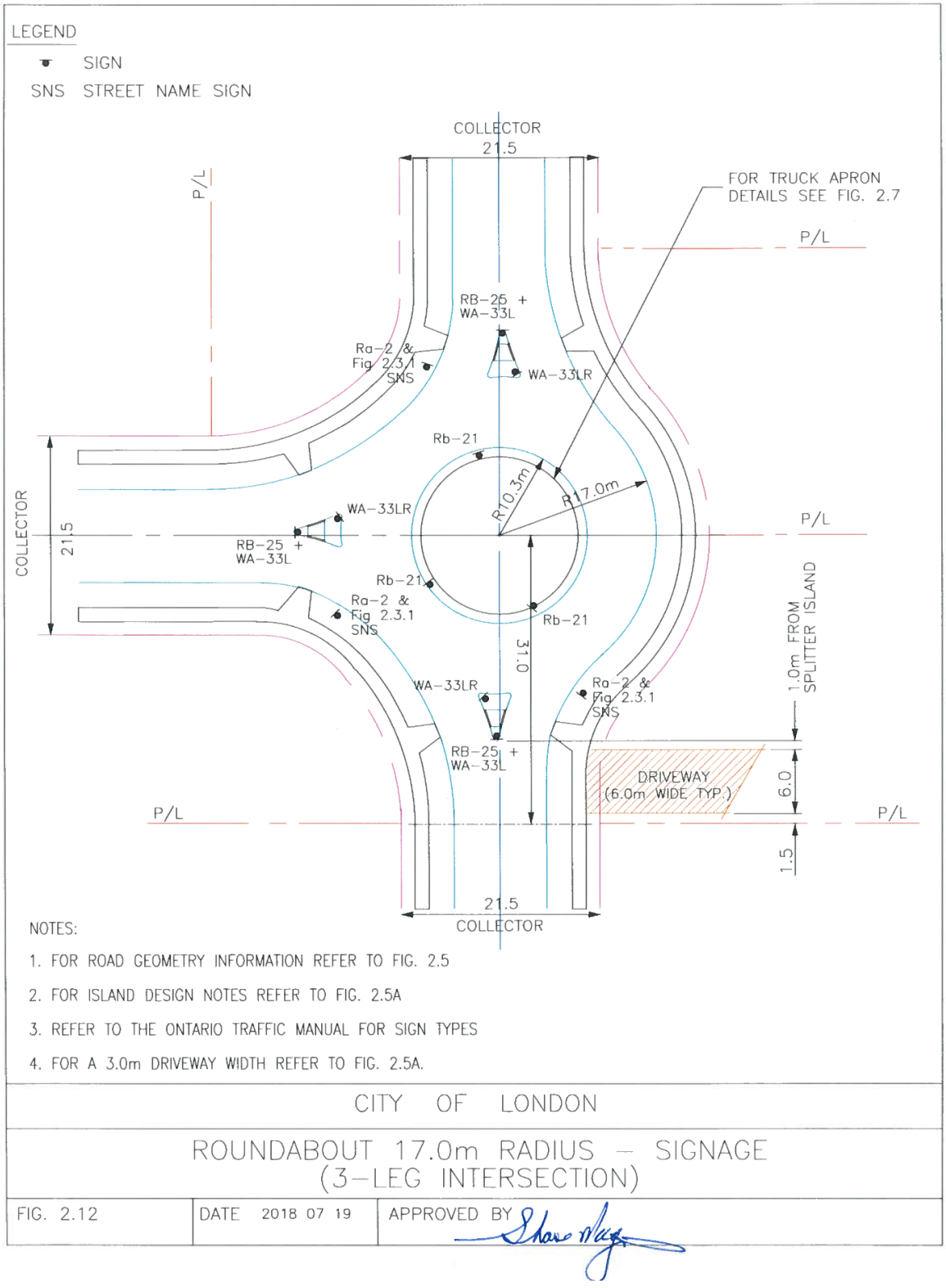


Figure 2.13 Roundabout 17.0m Radius – Signage (4-Leg Intersection)

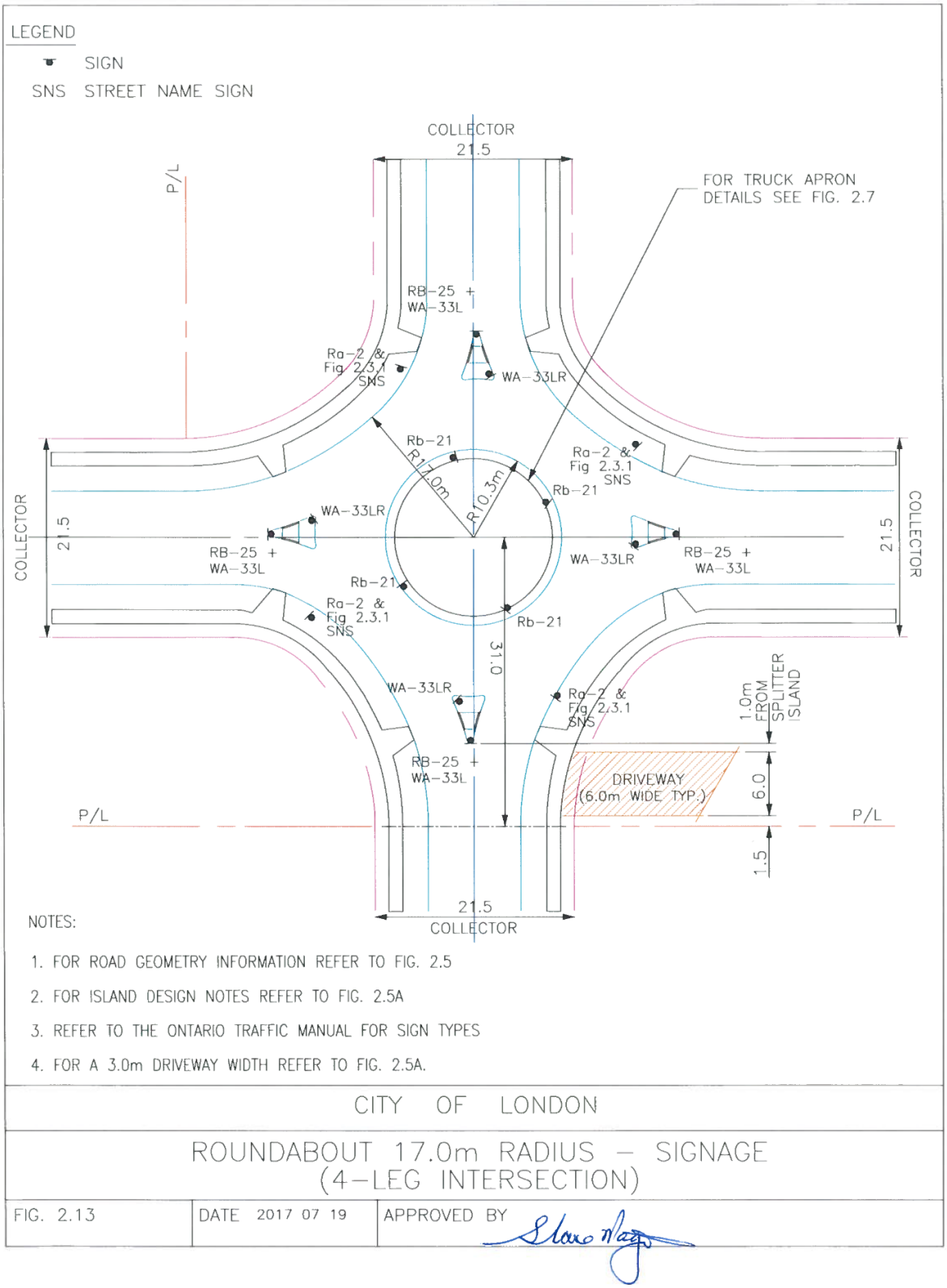


Figure 2.16 Gateway Without Island

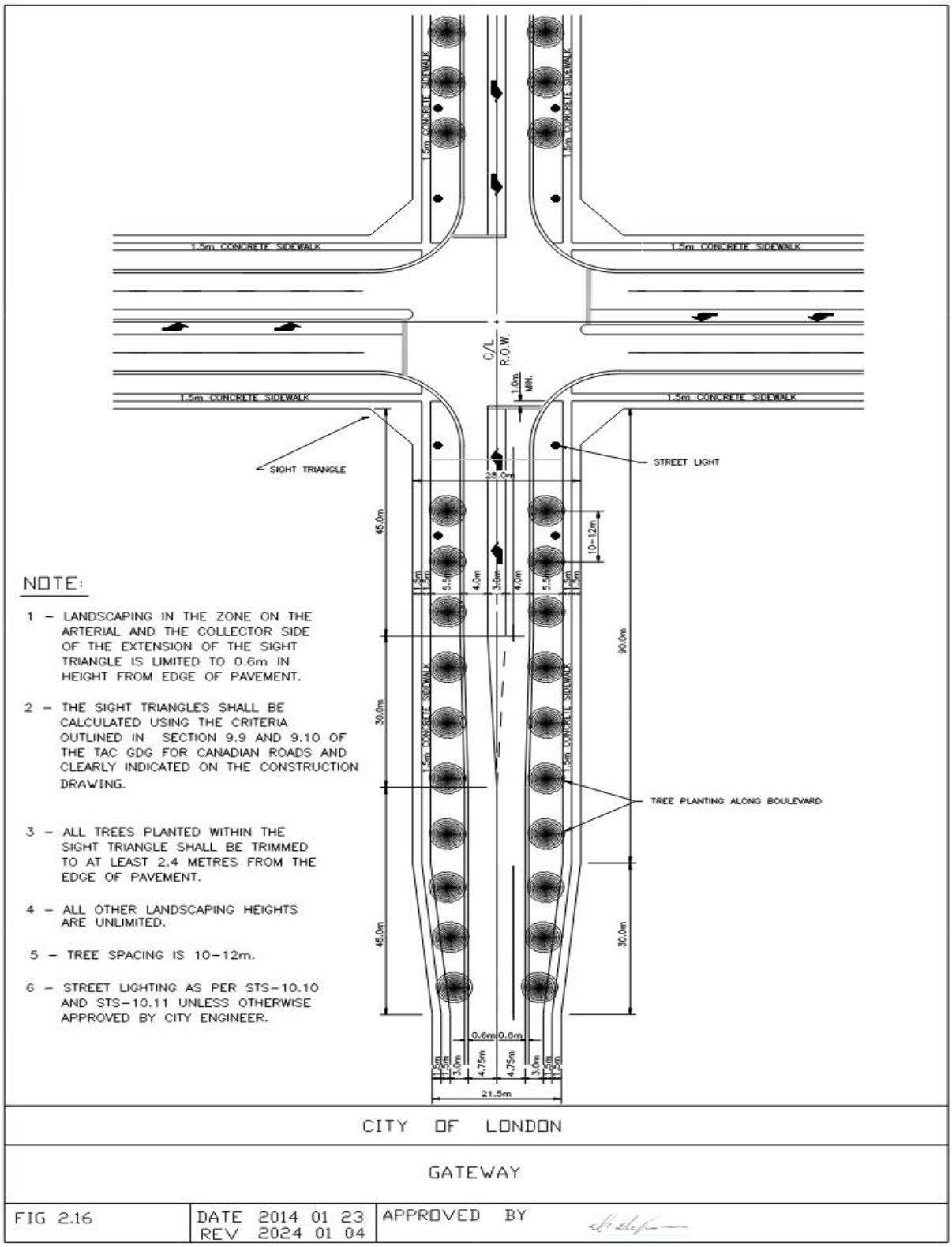


Figure 2.16A Subdivision Neighbourhood Connector Road Entrance

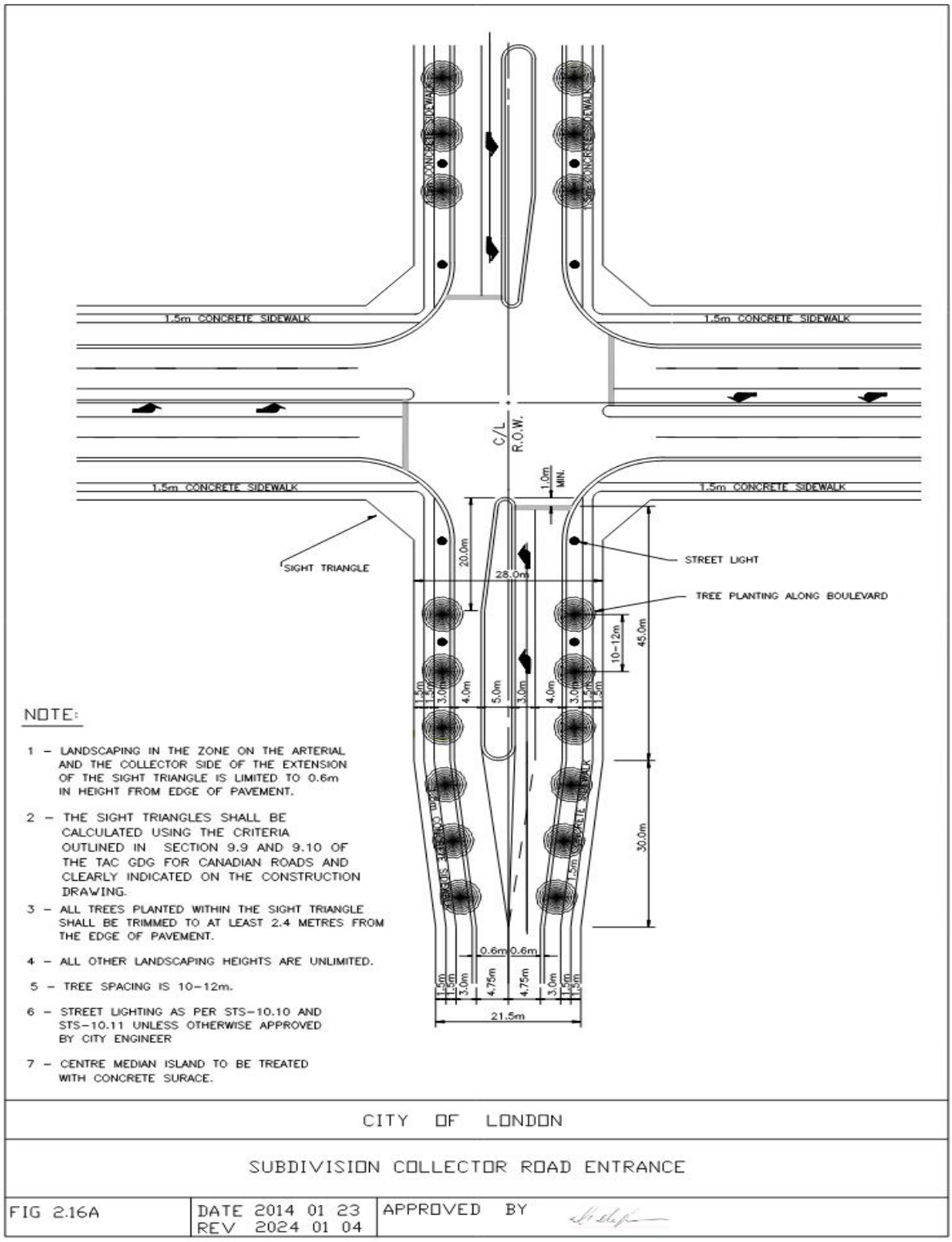


Figure 2.16B Gateway With Island

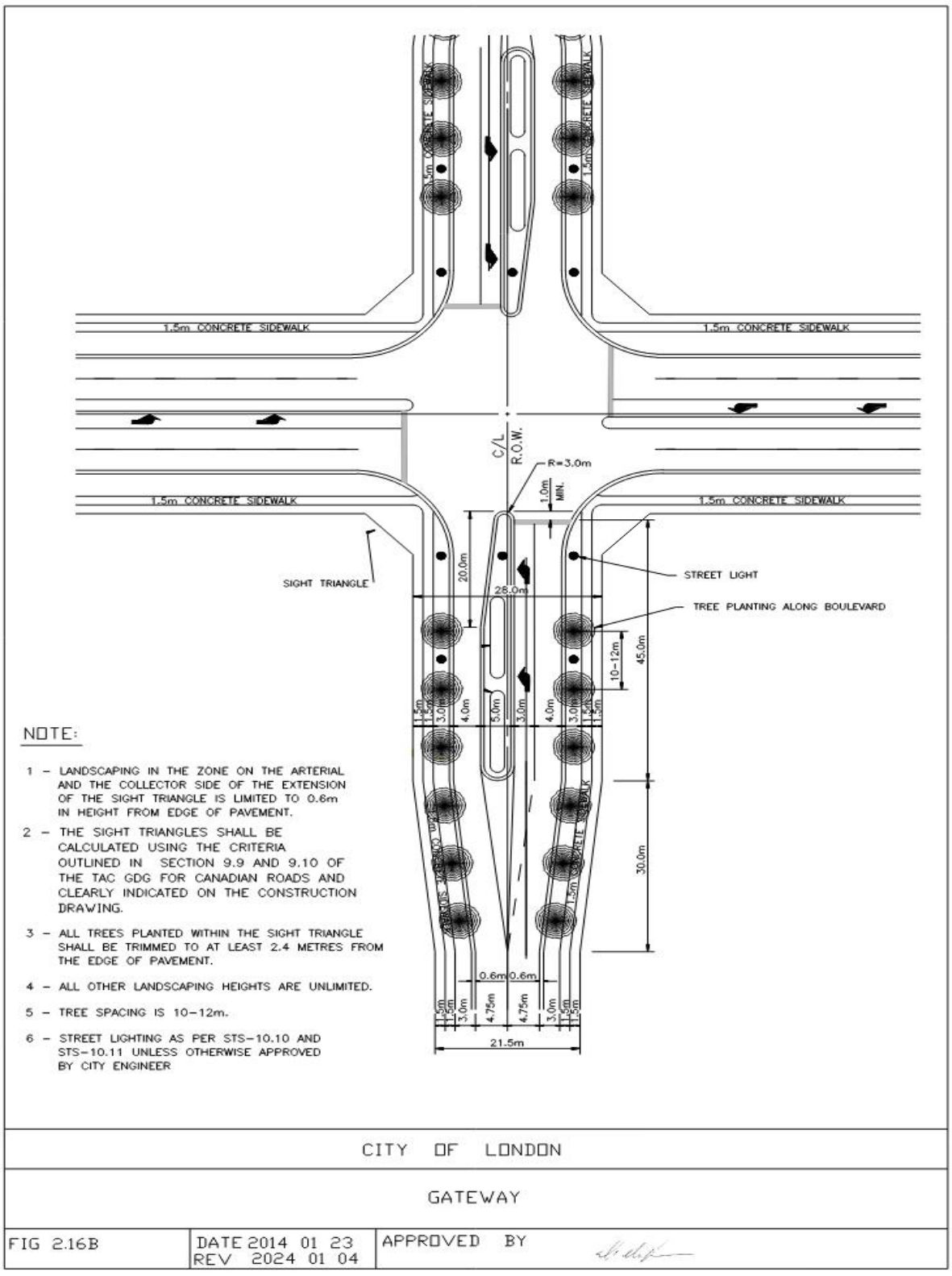


Figure 2.17 Residential Subdivision Street Light Layout

Manufacture	Road Width (Fixtures spacing 25 to 32 m)		Colour*
	8 m or less		
		Catalogue No.	
Cooper	59 W	PMM-SA1-C-730-U-SL3-AP-PR7-LS/HSS	AP (Grey)
Lumec	54 W	MPTRRC-55W32LED-3K-G3-LE3-120-DMG-HS-RCD7-COLOUR*	GY3TX (Medium Grey), BKTX (Black), GN8TX (Dark Forest Green)
		MPTCRC-55W32LED-3K- G3-LE3-120-DMG-HS-RCD7-COLOUR*	
		MPTCRR-55W32LED-3K- G3-LE3-120-DMG-HS-RCD7-COLOUR*	
Quattro	55 W	SRA400H-L3-55LEDL3.0-120-COLOUR*-HS-PTL1-COLOUR*	BKTX (Black), GNDTX (Dark Green)
		SRA420H-L3-55LEDL3.0-120-COLOUR*-HS-PTL1-COLOUR*	
		SRA422H-L3-55LEDL3.0-120-COLOUR*-HS-PTL1-COLOUR*	
	9.5m		
		Catalogue No.	
Cooper	67 W	PMM-SA1D-730-U-SL3-AP- PR7-LS/HSS	AP (Grey)
Lumec	75 W	MPTC-C - 40L1675WW-G1-3-UNV-DMG-RCD7-COLOUR*	
		MPTCCR-C - 40L1675WW-G1-3-UNV-DMG-RCD7-COLOUR*	GY3TX (Medium Grey), BKTX (Black), GN8TX (Dark Forest Green)
		MPTCRC-C - 40L1675WW-G1-3-UNV-DMG-RCD7-COLOUR*	
		MPTCRR-C - 40L1675WW-G1-3-UNV-DMG-RCD7-COLOUR*	
Quattro	70 w	SRA400H-L3-70LEDL3.0-120-COLOUR*-HS-PTL1-COLOUR*	BKTX (Black), GNDTX (Dark Green)
		SRA420H-L3-70LEDL3.0-120-COLOUR*-HS-PTL1-COLOUR*	
		SRA422H-L3-70LEDL3.0-120-COLOUR*-HS-PTL1-COLOUR*	

NOTE: If the planned design does not meet the template layouts, please contact Traffic Engineering 519-661-4580 or roadwaylights@london.ca

CITY OF LONDON STANDARD DRAWING		
RESIDENTIAL SUBDIVISION STREET LIGHT LAYOUT		
FIG 2.17	DATE: 2024-02-02	APPROVED BY:

Figure 2.18 Residential Subdivision Intersection Street Light Layout

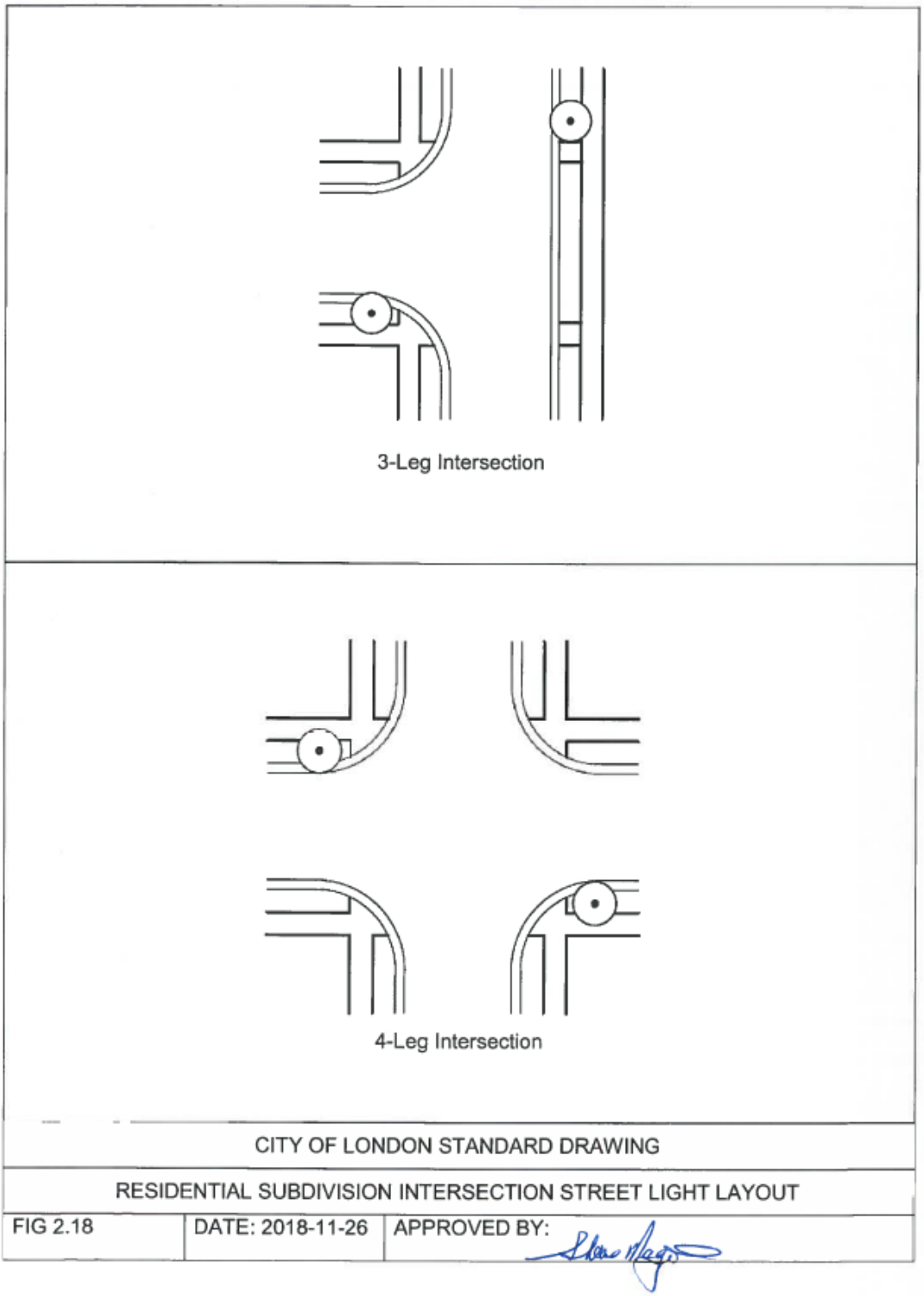
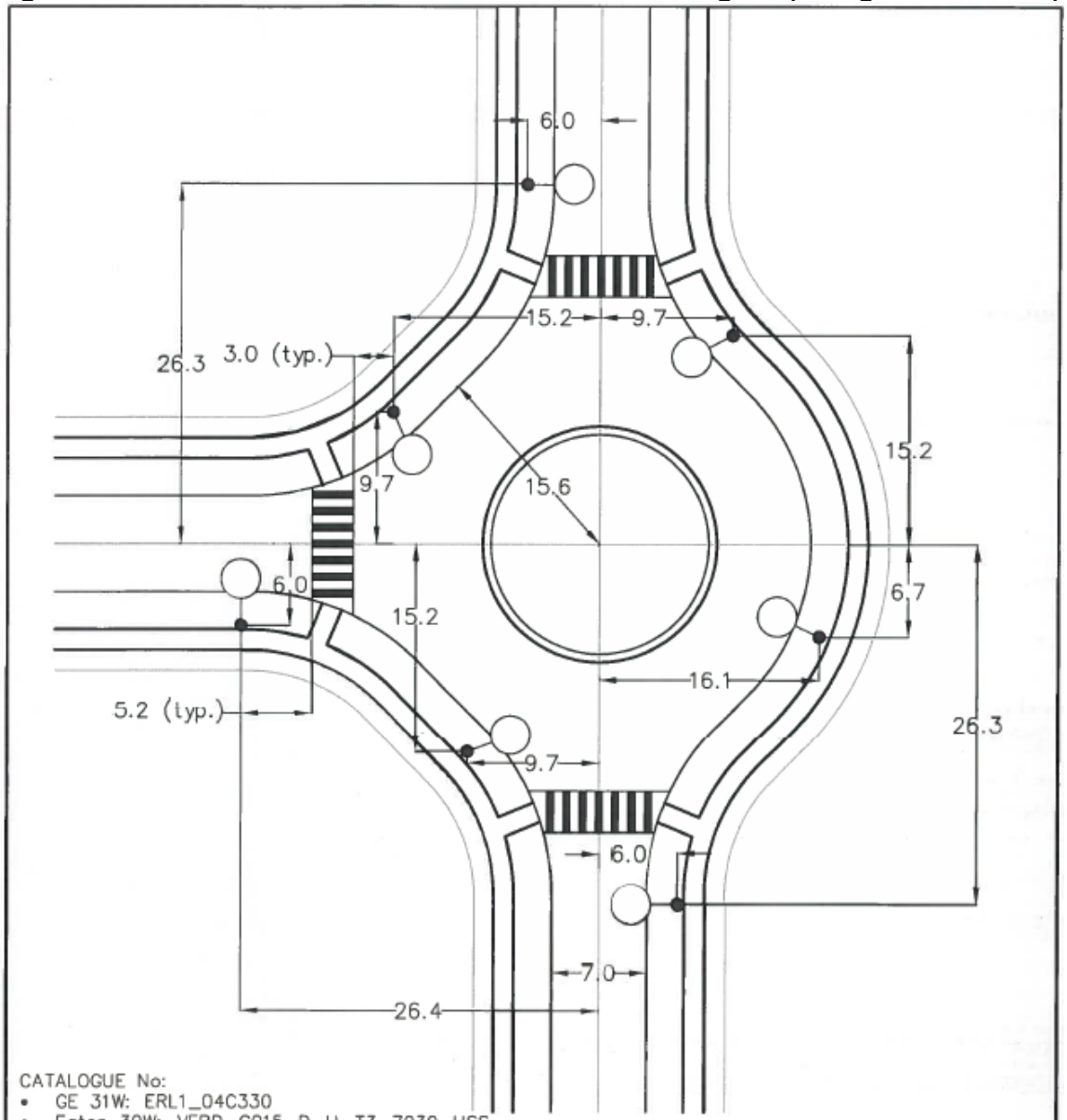


Figure 2.20A Roundabout 15.6m Radius – Street Lights (3-Leg Intersection)



CATALOGUE No:
- GE 31W: ERL1_04C330
- Eaton 30W: VERD-C015-D-U-T3-7030-HSS

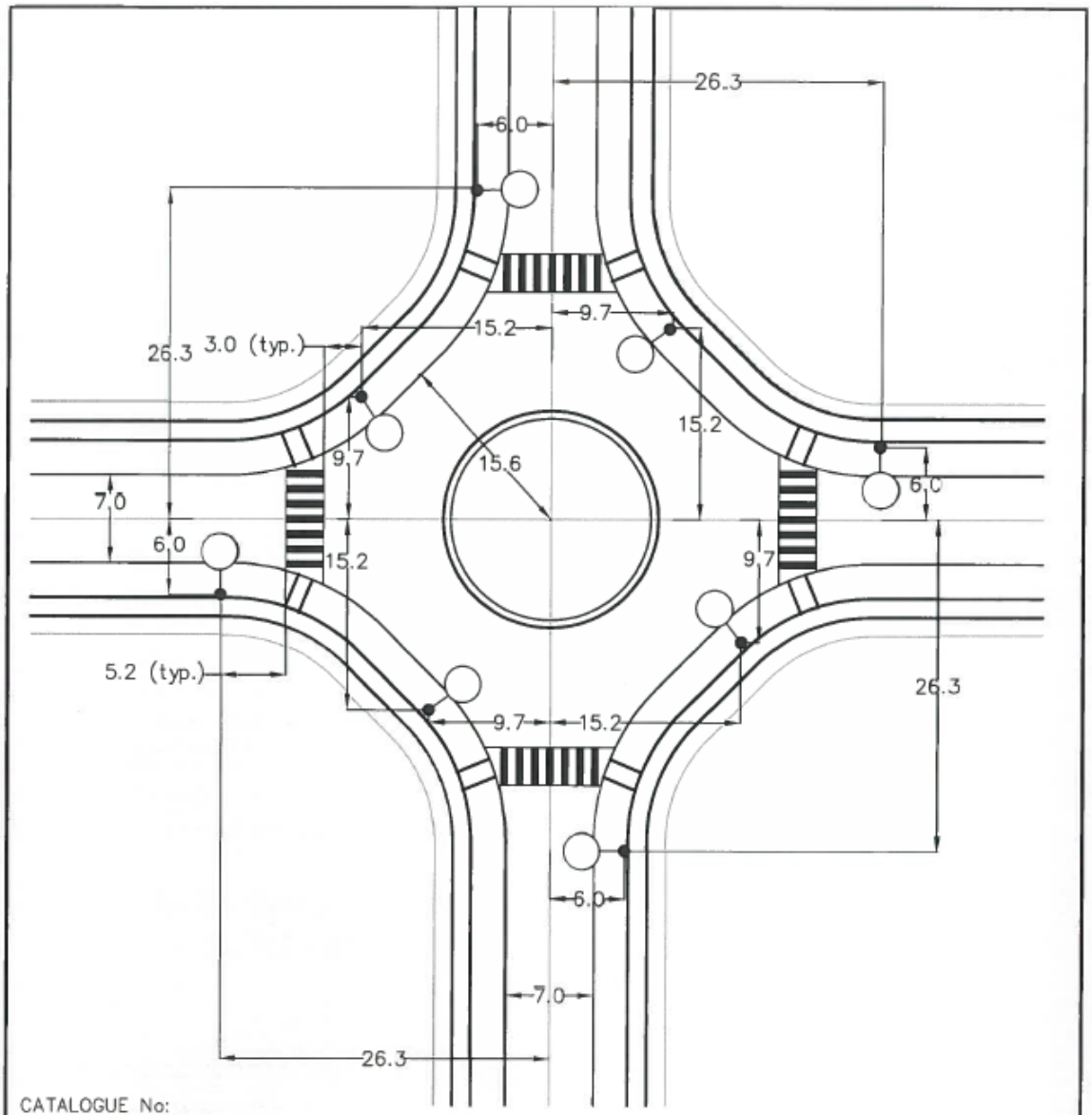
NOTES:
- STREETLIGHT POLES ARE 7.6m ABOVE GRADE. LUMINAIRES ARE MOUNTED 8.8m ABOVE GRADE ON A 2.4m ARM.
- REFER TO SR-20.0-B; TYPES OF PAVEMENT MARKINGS
- ALL DIMENSIONS IN METERS UNLESS OTHERWISE SPECIFIED

CITY OF LONDON

ROUNDABOUT 15.6m RADIUS – STREET LIGHTS
(3-LEG INTERSECTION)

Fig. 2.20A	DATE 2019-01-17	APPROVED BY

Figure 2.20B Roundabout 15.6m Radius – Street Lights (4-Leg Intersection)



CATALOGUE No:
- GE 31W: ERL1_04C330
- Eaton 30W: VERD-C015-D-U-T3-7030-HSS

NOTES:
- STREETLIGHT POLES ARE 7.6m ABOVE GRADE. LUMINAIRES ARE MOUNTED 8.8m ABOVE GRADE ON A 2.4m ARM.
- REFER TO SR-20.0-B; TYPES OF PAVEMENT MARKINGS
- ALL DIMENSIONS IN METERS UNLESS OTHERWISE SPECIFIED

CITY OF LONDON

ROUNDABOUT 15.6m RADIUS – STREET LIGHTS
(4-LEG INTERSECTION)

Fig. 2.20B	DATE 2019-01-17	APPROVED BY

Figure 2.21A Roundabout 17.0m Radius – Street Lights (3-Leg Intersection)

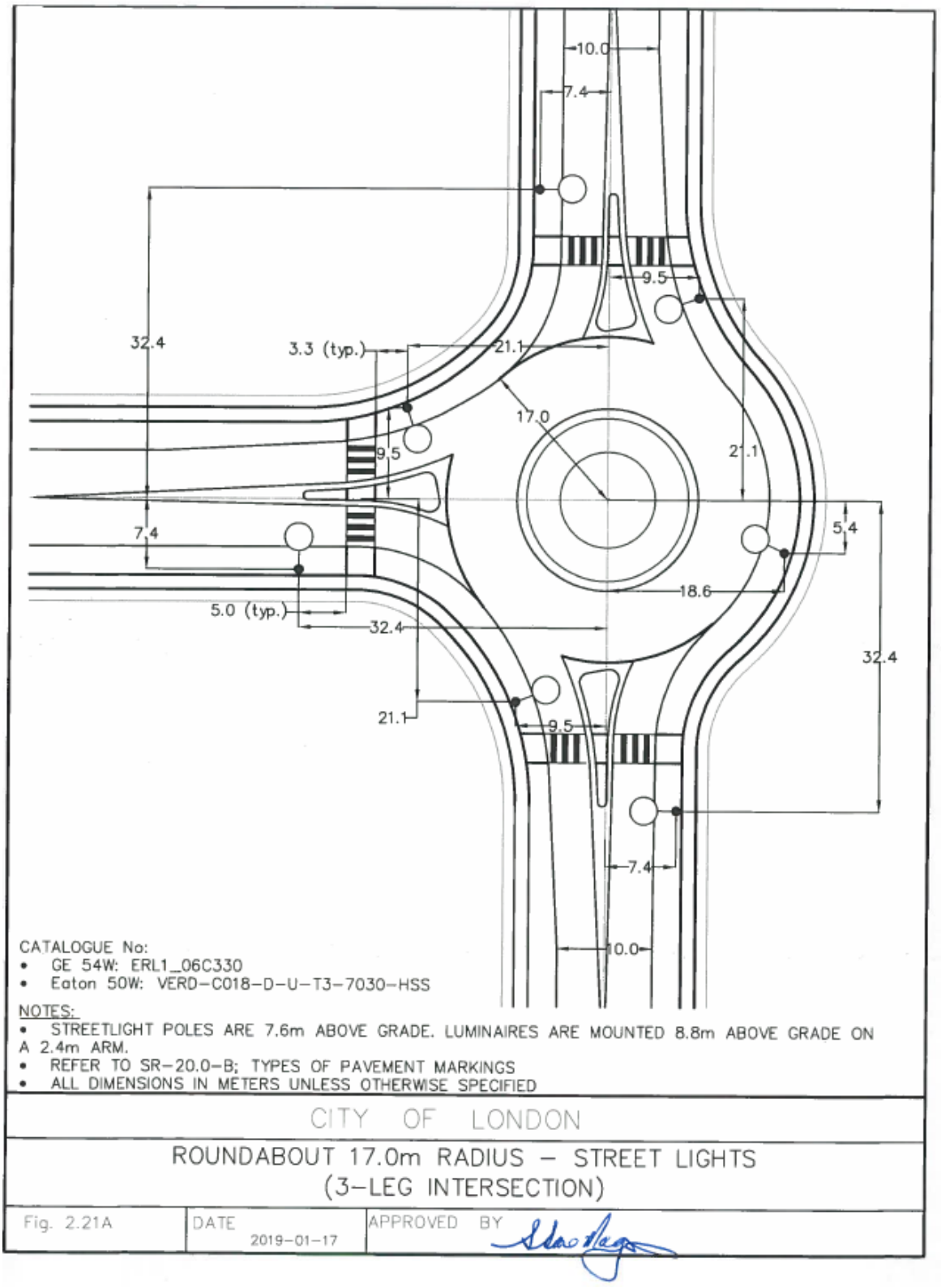
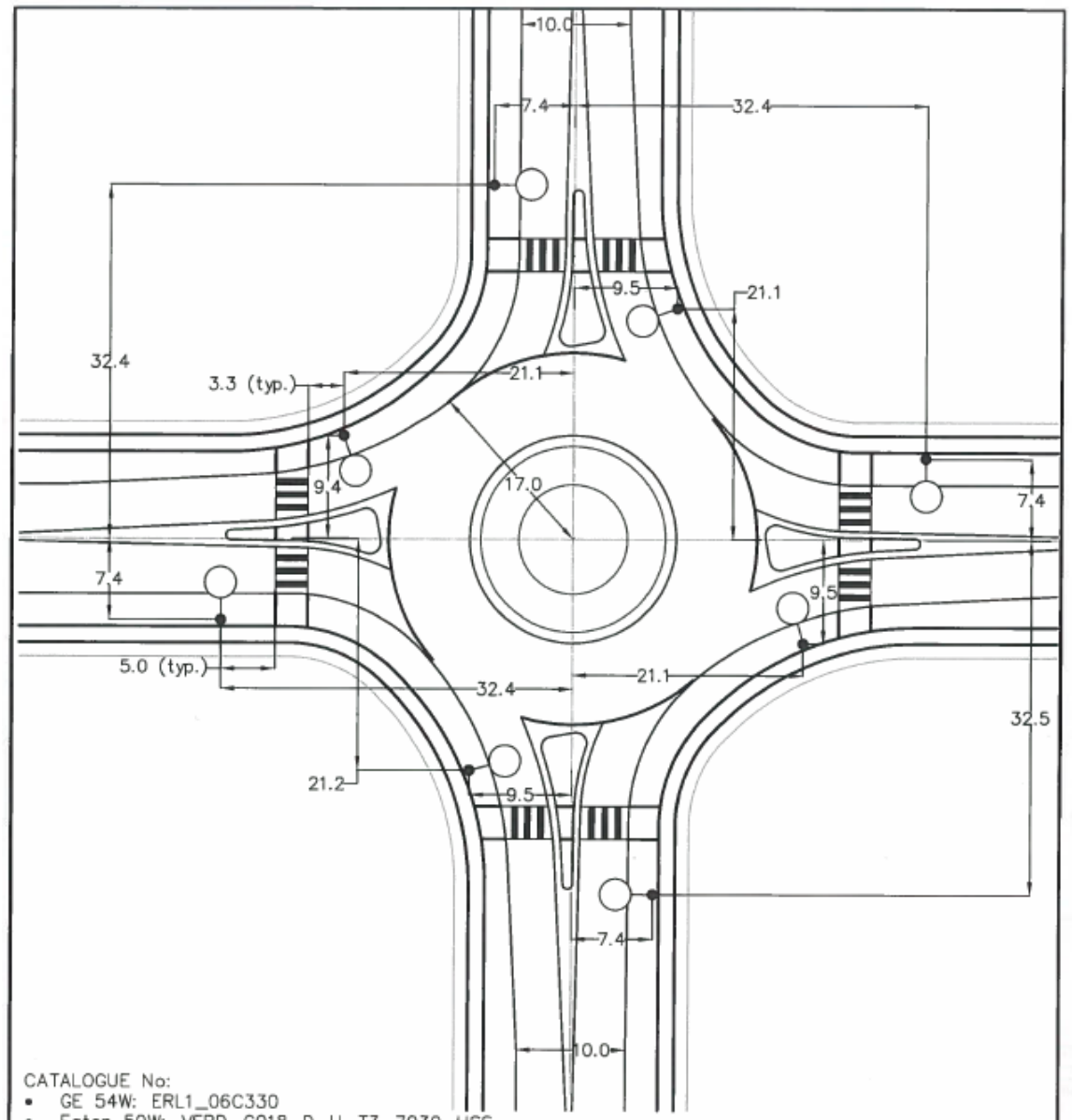


Figure 2.21B Roundabout 17.0m Radius – Street Lights (4-Leg Intersection)



CATALOGUE No:
- GE 54W: ERL1_06C330
- Eaton 50W: VERD-C018-D-U-T3-7030-HSS

NOTES:
- STREETLIGHT POLES ARE 7.6m ABOVE GRADE. LUMINAIRES ARE MOUNTED 8.8m ABOVE GRADE ON A 2.4m ARM.
- REFER TO SR-20.0-B; TYPES OF PAVEMENT MARKINGS
- ALL DIMENSIONS IN METERS UNLESS OTHERWISE SPECIFIED

CITY OF LONDON

ROUNDABOUT 17.0m RADIUS – STREET LIGHTS
(4-LEG INTERSECTION)

Fig. 2.21B	DATE 2019-01-17	APPROVED BY

Figure 2.22 Urban Thoroughfare & Civic Boulevard Intersection

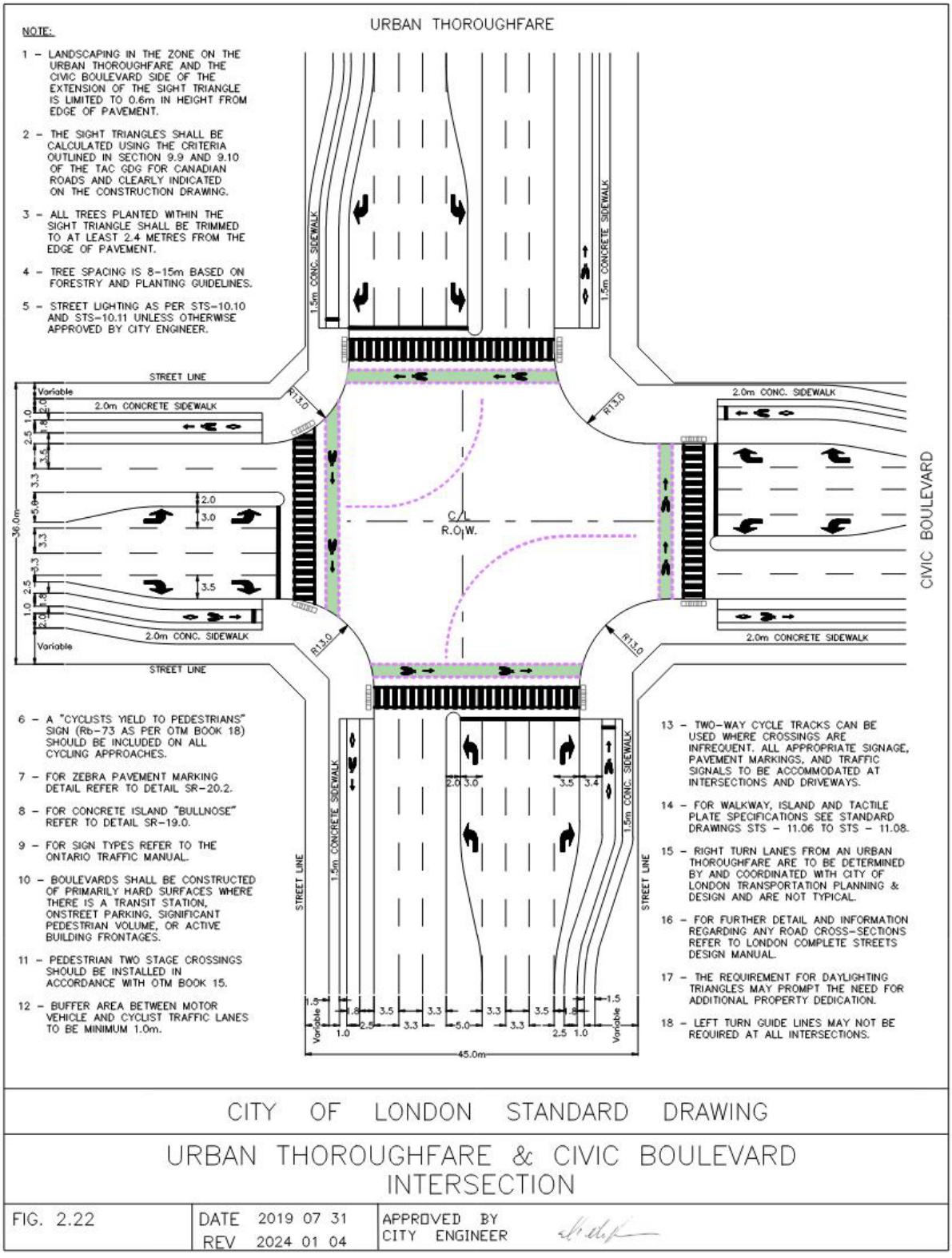


Figure 2.23 Urban Thoroughfare & Neighbourhood Connector Intersection

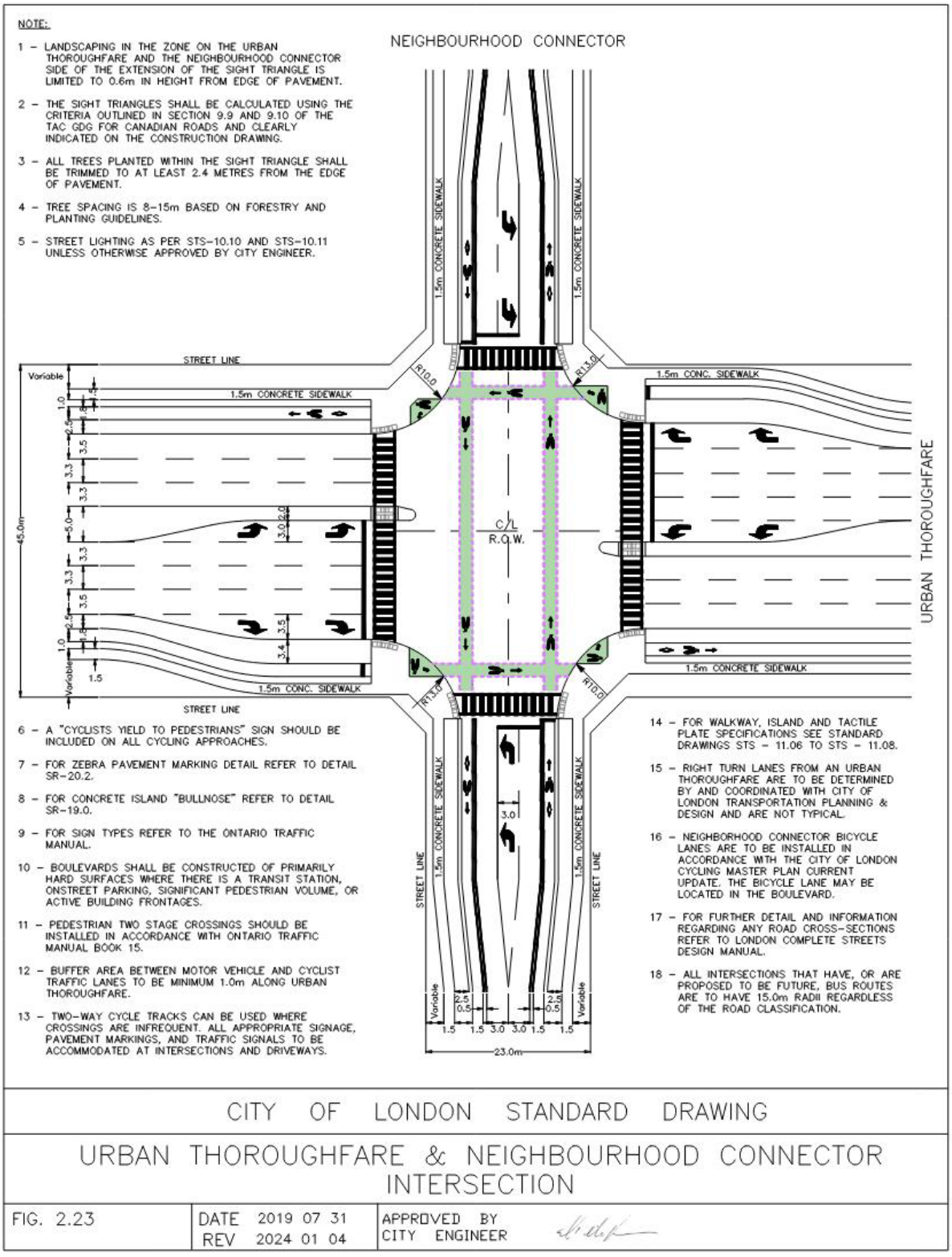


Figure 2.24 Urban Thoroughfare & Rapid Transit Boulevard Intersection

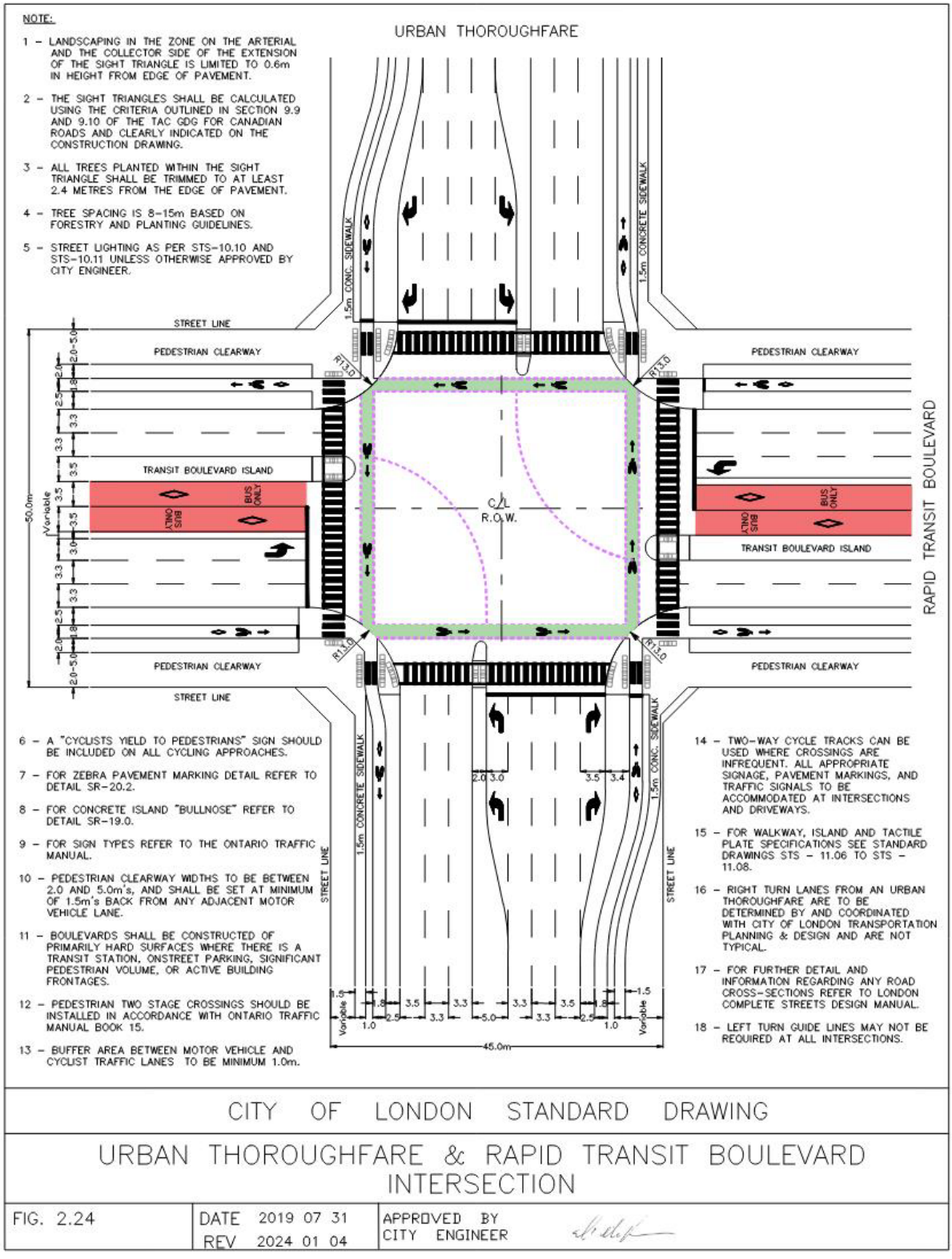


Figure 2.25 Urban Thoroughfare & Main Street Intersection

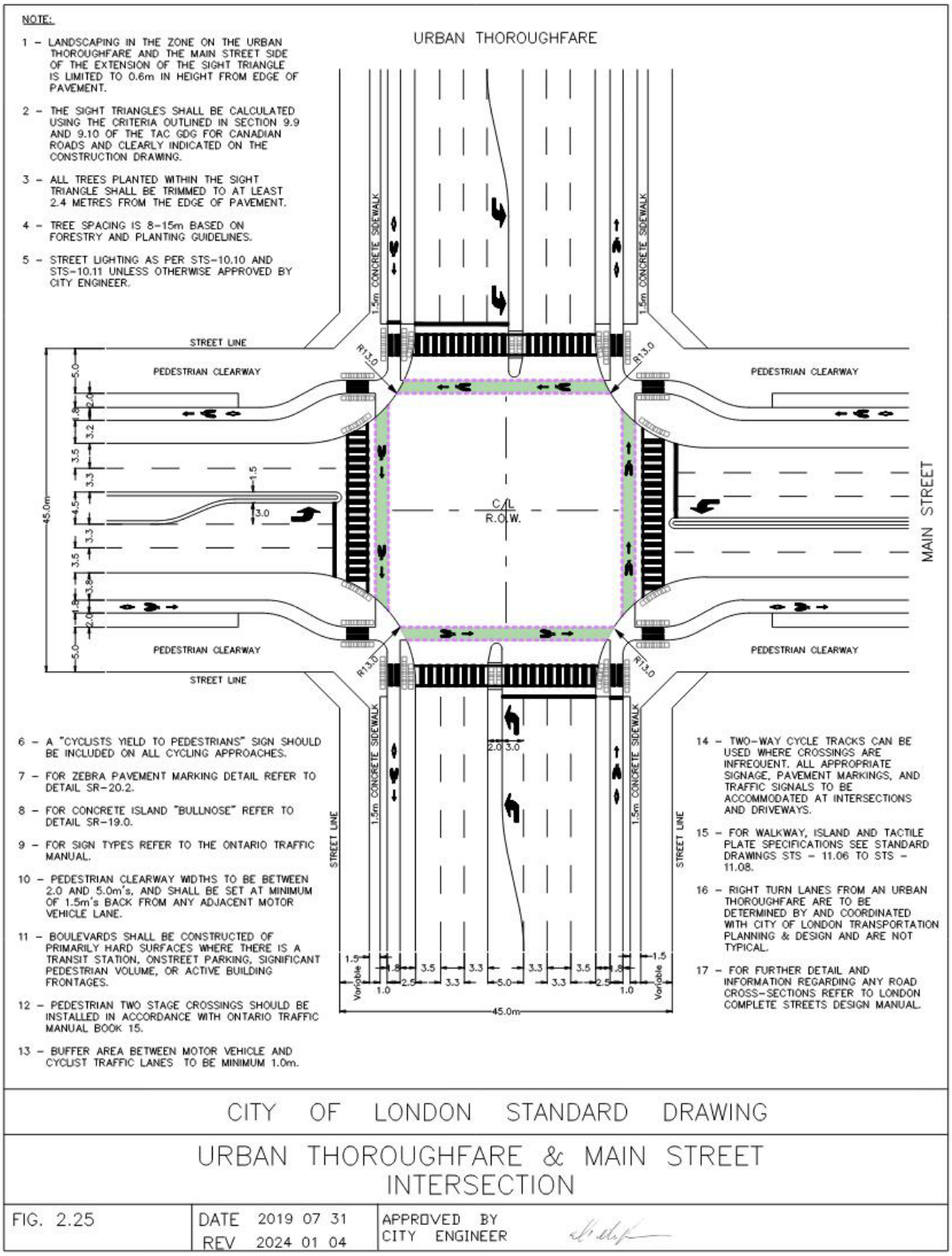


Figure 2.26 Urban Thoroughfare & Neighbourhood Street Intersection

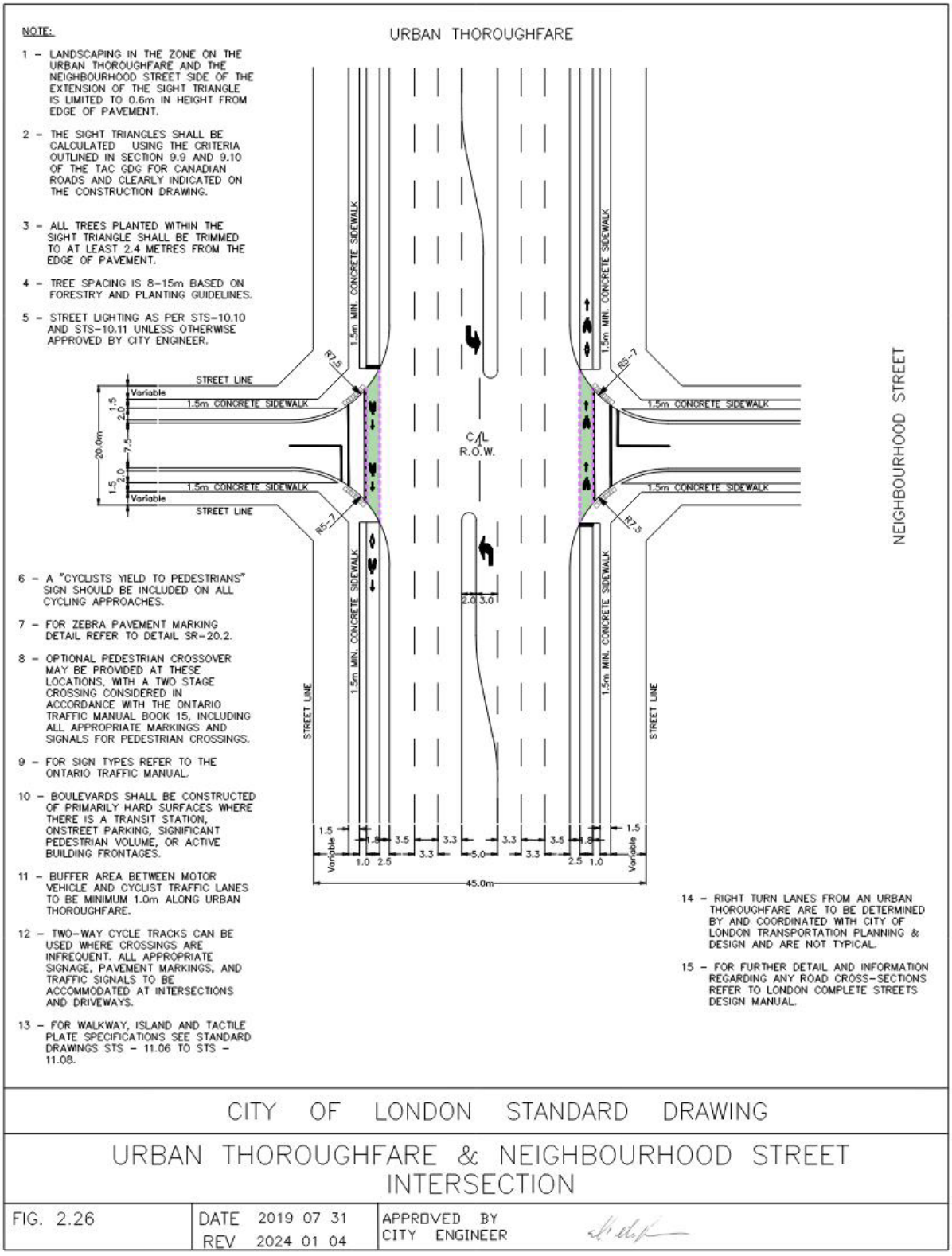


Figure 2.27 Civic Boulevard & Neighbourhood Connector Intersection

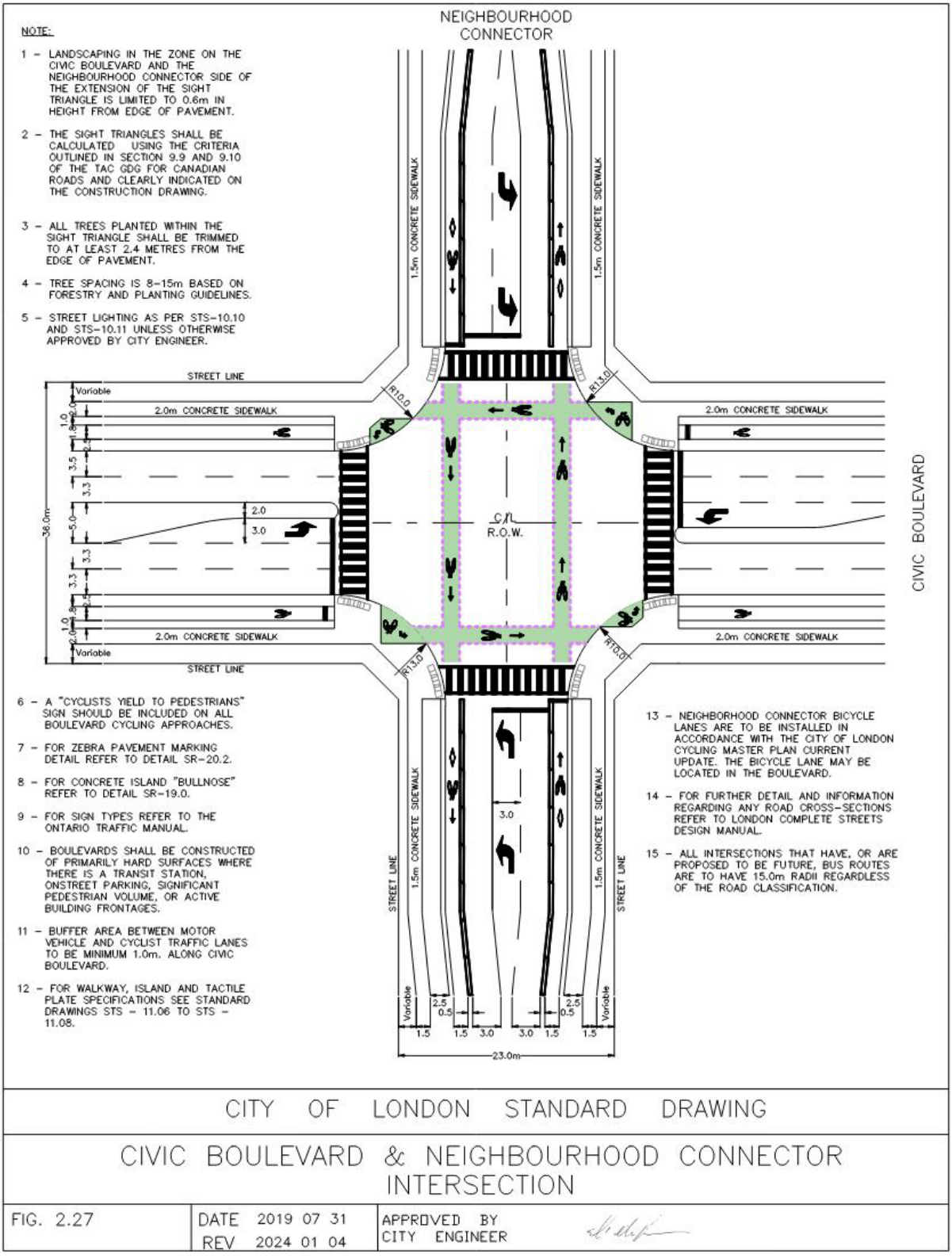


Figure 2.28 Civic Boulevard & Neighbourhood Street Intersection

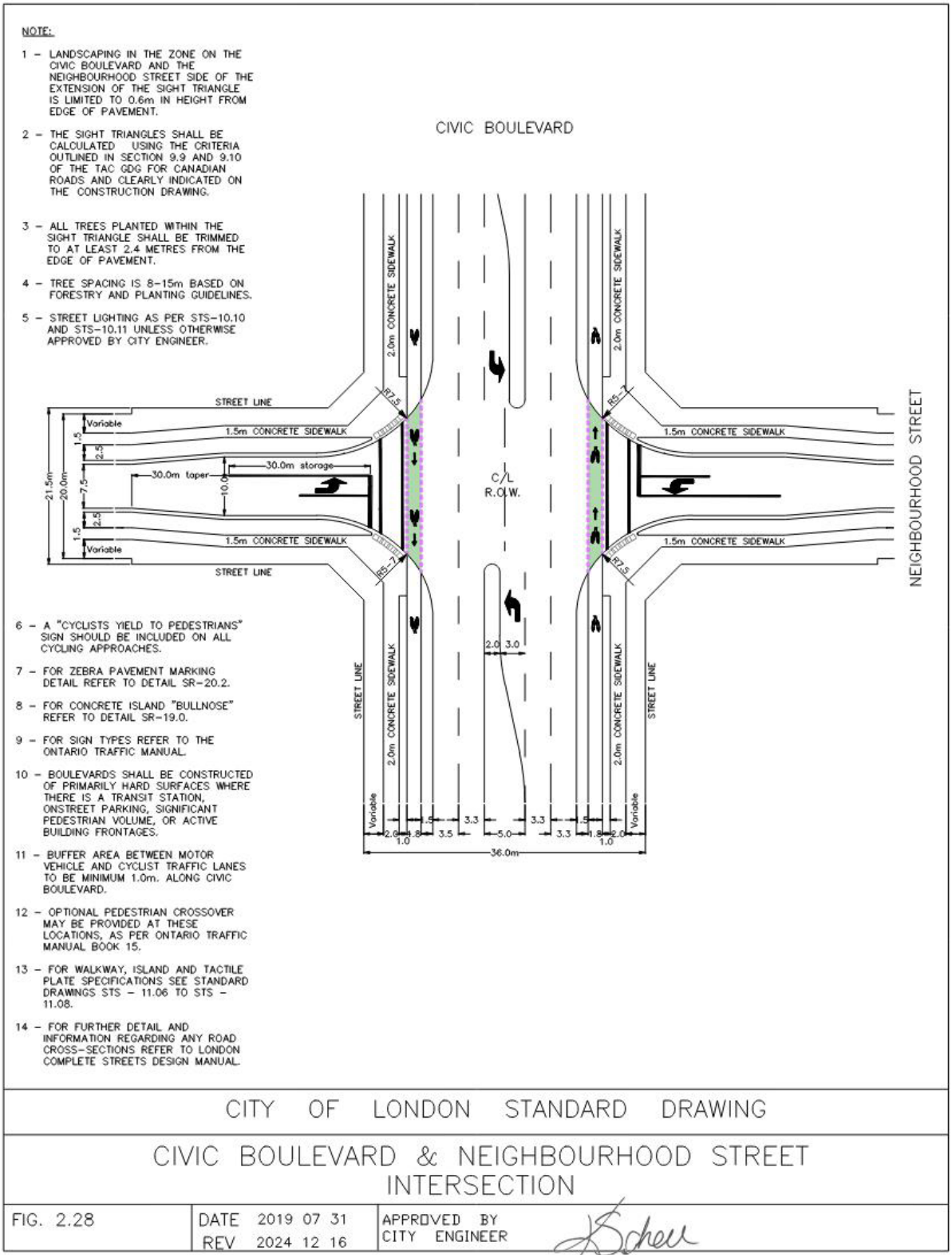


Figure 2.29 Civic Boulevard & Rapid Transit Boulevard Intersection

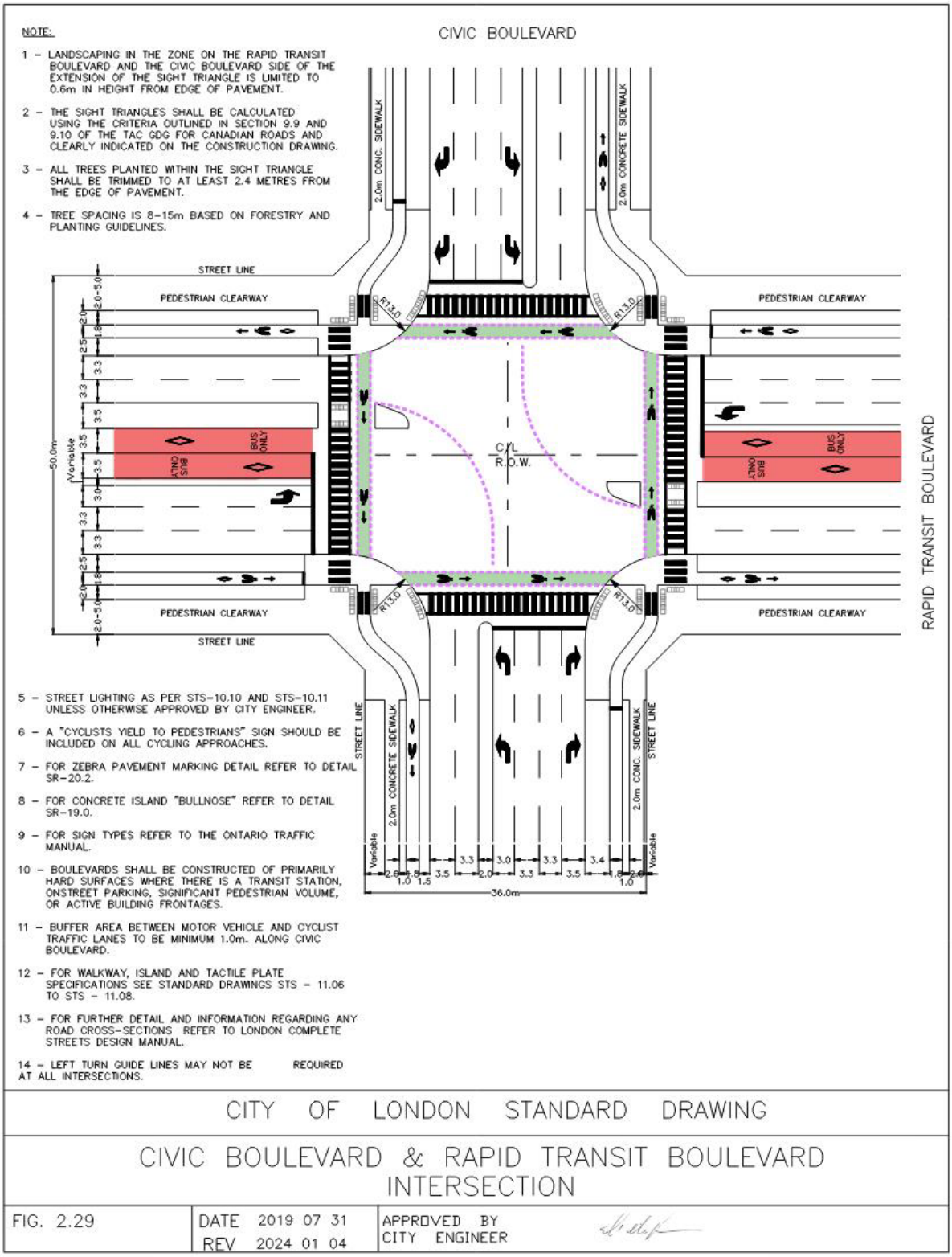


Figure 2.30 Civic Boulevard & Main Street Intersection

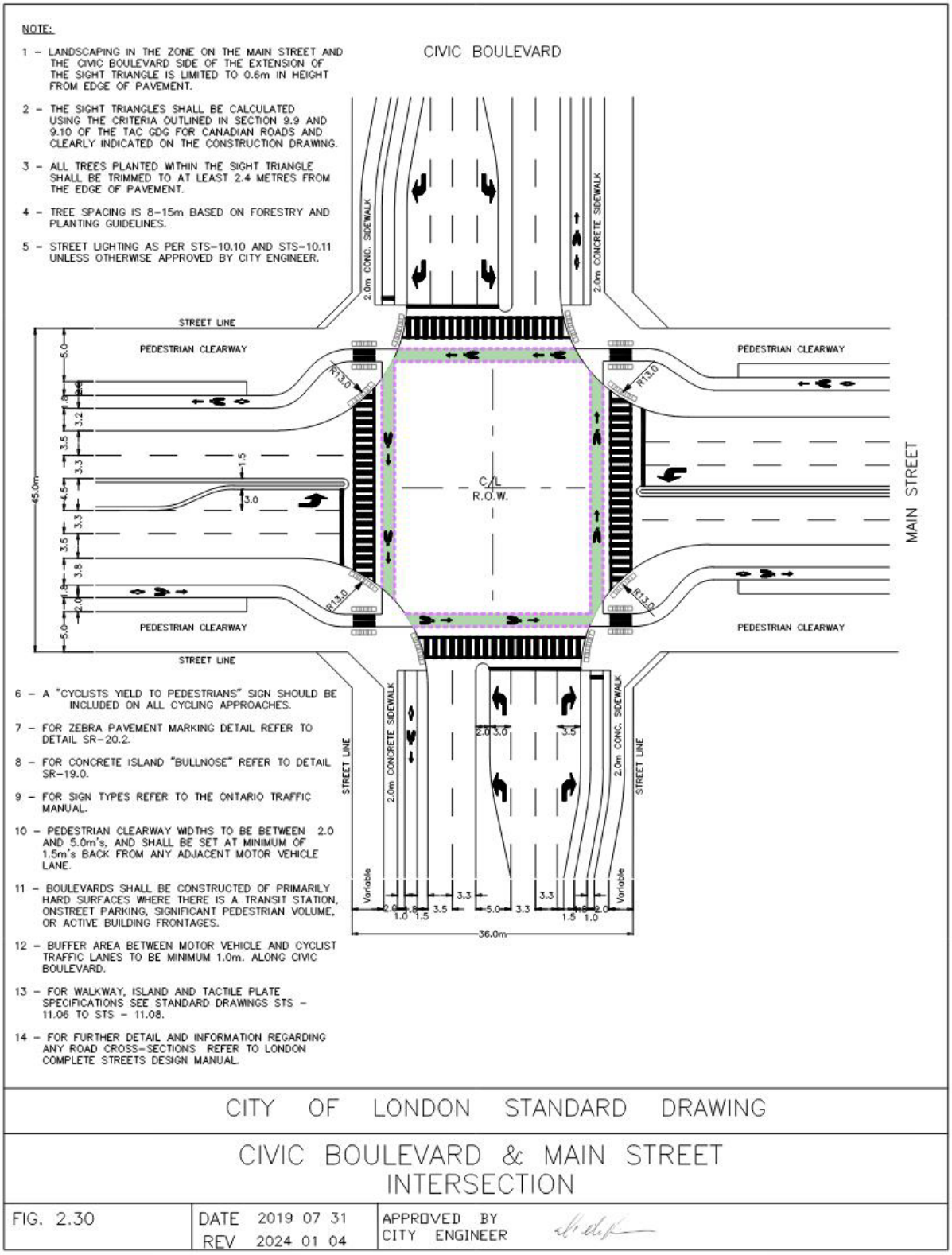


Figure 2.31 Neighbourhood Connector & Neighbourhood Street Intersection

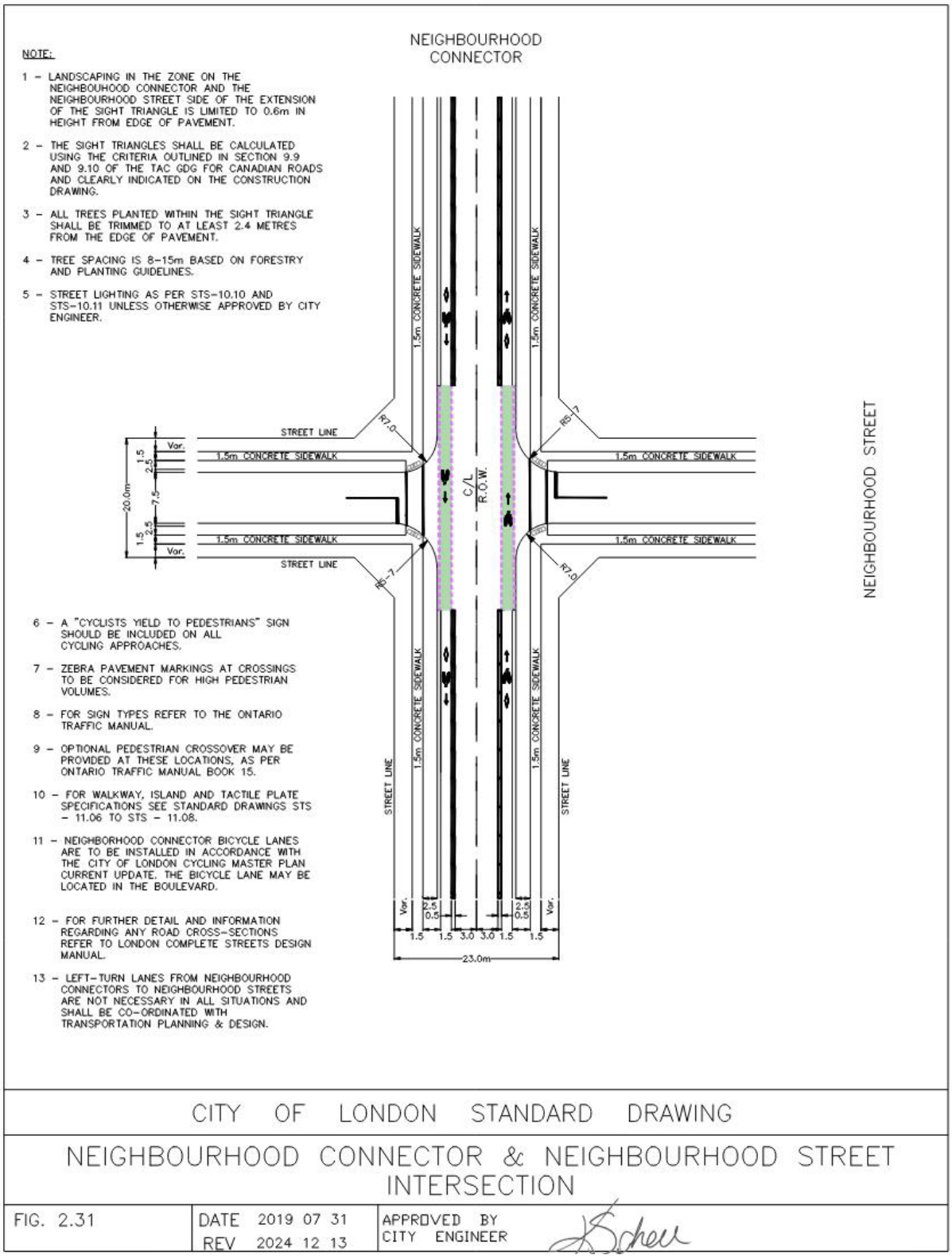


Figure 2.32 Rapid Transit Boulevard & Neighbourhood Connector Intersection

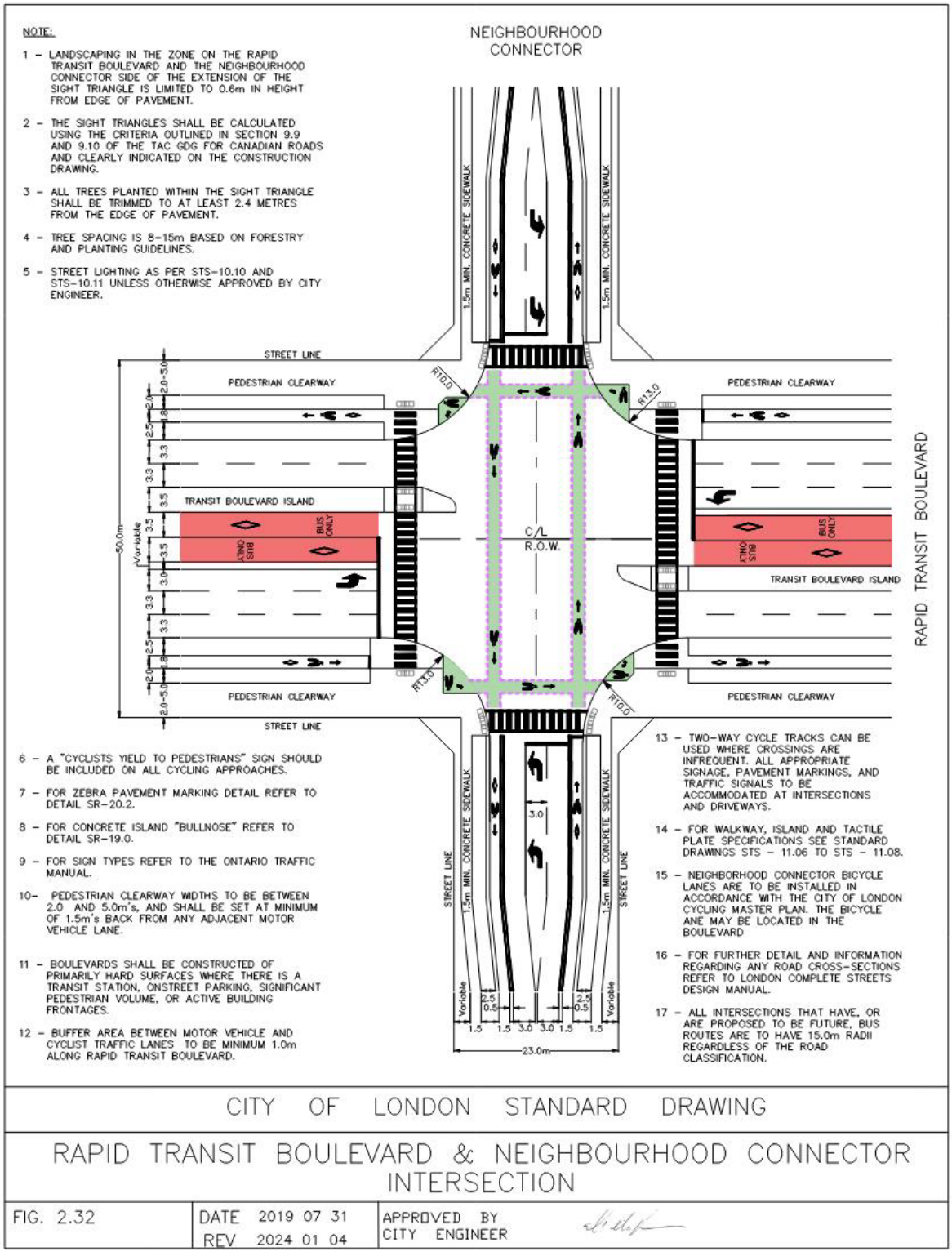


Figure 2.33 Rapid Transit Boulevard & Main Street Intersection

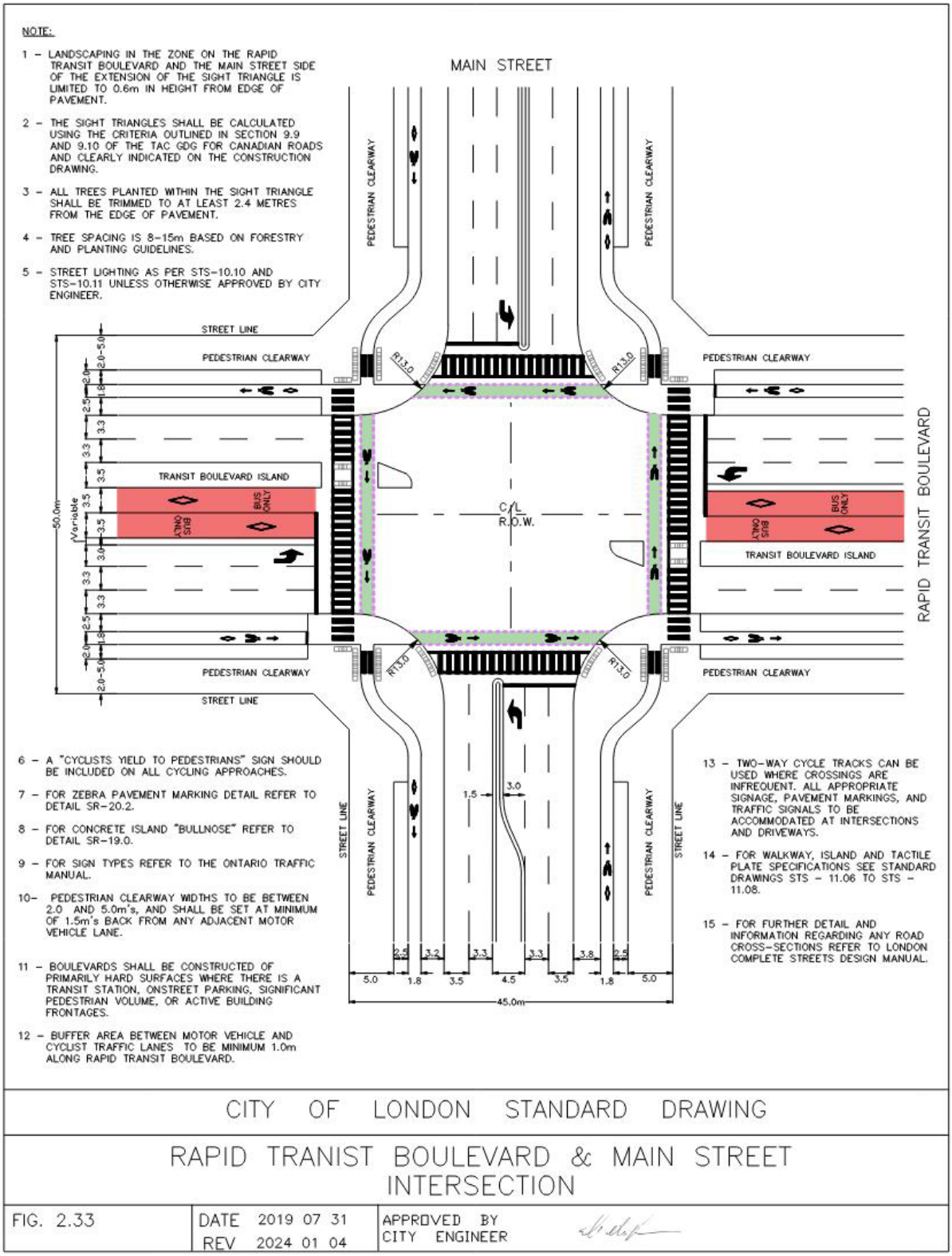


Figure 2.34 Rapid Transit Boulevard & Neighbourhood Street Intersection

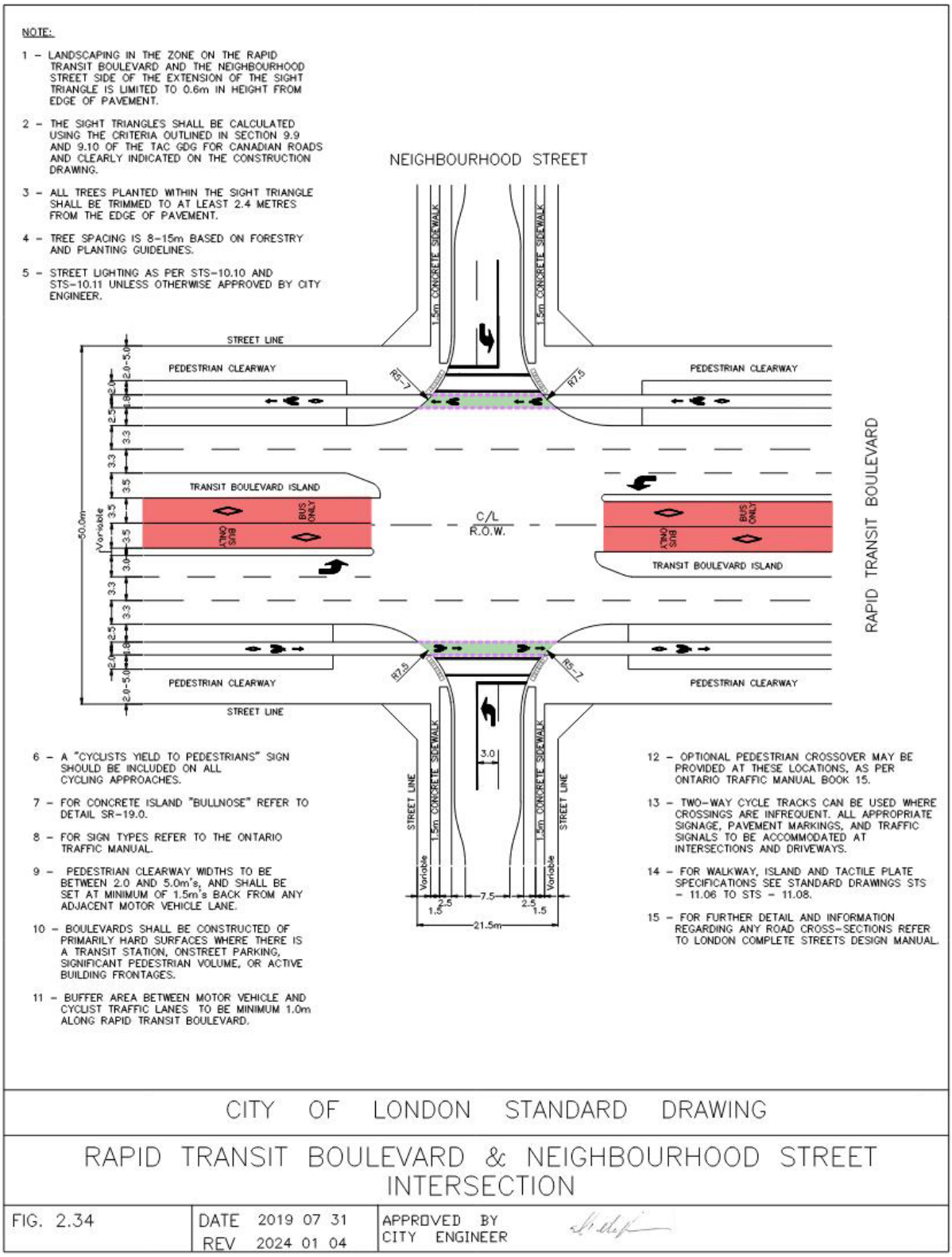


Figure 2.35 Main Street & Neighbourhood Street Intersection

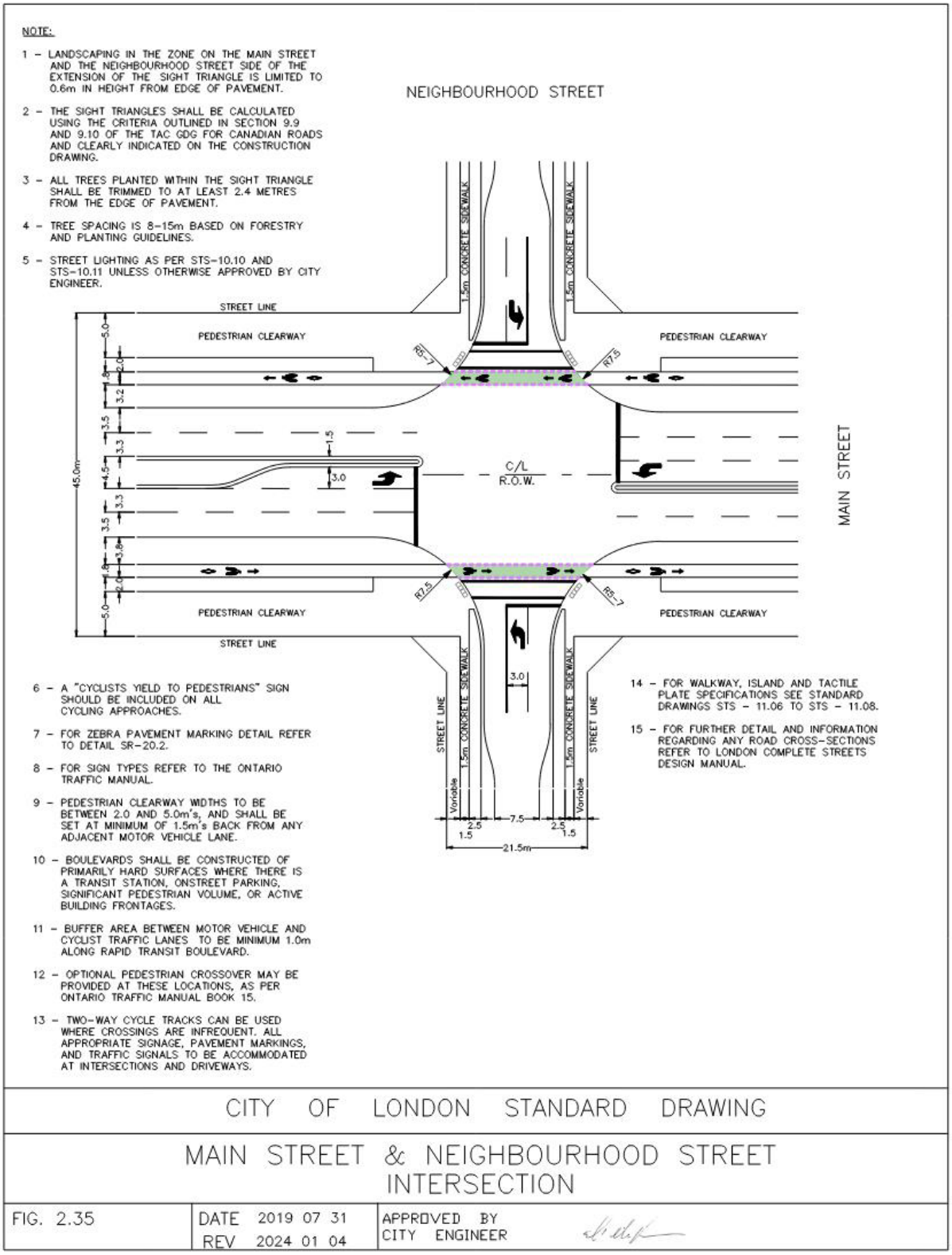


Figure 2.36 Main Street & Neighbourhood Connector Intersection