Oxford County

Growing stronger together

SECTION 2 – ENGINEERING DRAFTING STANDARDS

TABLE OF CONTENTS

FIGURES

1.1 General Requirements

a) A complete set of drawings shall consist of separate drawings of some or all of the following:

- Site plan
- Plan and profile for roads, drainage and storm sewers
- Plan and profile for sanitary sewers and watermains
- Plan and profile for sanitary and storm sewers for common trench designs
- Plan of proposed street lighting, hydro, telephone, cablevision and gas
- Plan of proposed signage and pavement markings
- Additional plans showing any special detail and cross-sections (i.e. removals, grading, temporary watermain plan, etc.)

b) Maximum drawing size shall be 610 mm x915 mm (24" x 36").

c) The County of Oxford contract drawings and AutoCAD standards are based on the current versions of the industry standard software by Autodesk: AutoCAD and Civil 3D Design. All drawings submitted to the County of Oxford must be in DWG format using AutoDesk AutoCAD support versions.

d) Drawings scales and dimensions shall be shown on all drawings.

e) The drawings shall be neat and legible with adequate clearance margins between the drawing information and the title block border. Notes and text shall locate and describe the proposed work in sufficient detail to facilitate construction. Limits of construction and match lines shall be clearly marked on the drawing.

f) Plan and profile drawings shall be drawn with the profile on the bottom of the drawing sheet lined up under the plan if possible. Center line stations, utilities, inverts, material and grade information shall be located across the bottom of the profile.

g) North arrow shall be oriented in the two northerly quadrants, if possible.

h) Lettering shall be to Leroy metric heights and widths. Vertical upper case lettering is preferred. Lettering shall be unobstructed by linework and other drawing information. Conflicts between linework, symbols, dimensioning or text shall be removed.

i) Construction notes shall be boxed and located around the perimeter of the drawing, tagged to the drawing feature.

j) All elevations shown on the drawings shall be metric geodetic datum. The source and location of the datum shall be clearly noted on each drawing (see Section 1 – General 1.5 Drawing and Design Requirements)

k) The drawing title block shall be the County of Oxford Standard Title Block and shall include the project name, project location, type of drawing (i.e. site Plan) and Engineer's name and/or company name and logo, Engineering File No. and the County of Oxford drawing number and key plan

l) Plan profile drawings shall conform to scales as in Section 1- General 1.5 Drawing and Design Requirements.

m) Standard details such as manholes, catch basins, hydrants, etc., that are shown and described in the County of Oxford Design Guidelines and Supplemental Specifications for Municipal Services need not be shown in detail on the drawings; the standard Drawing No. shall be quoted on the plan for reference. Standard symbols, abbreviations, materials, and hatch patterns shall be used. Any additional symbols, abbreviations, materials, and hatch patterns shall be included in the County of Oxford standard legend.

n) All drawings shall bear the dated stamp/seal and signature of the professional engineer responsible for the design.

o) Provisions shall be made on all drawings for the insertion of the County of Oxford drawing number in the space provided labeled "Drawing No." The County of Oxford will provide the number for insertion on the drawing. Consultant drawing number will be placed immediately above in the space labeled for that purpose.

p) Numerical values on the construction drawings shall be shown to two (2) decimal places unless accuracy warrants otherwise.

2.1 – Site Plan and Key Plans

a) The site plan of the construction works shall be scaled as in Section 1 – General 1.5 Drawing and Design Requirements

b) The following existing and proposed information shall be shown on the Site Plan:

- Existing watercourse
- Pavement, curbs
- Ditches, culverts, storm sewers, manholes cleanouts, inlet/outlet structures and catch basins
- Sanitary sewers, manhole, cleanouts.
- Watermains, valves, hydrants, chambers, blowoffs
- All pertinent property, right-of-way and easements
- Road allowance and easement dimensions
- Lot numbers and existing legal plan numbers
- One meter contour lines for slopes greater than 10% existing and proposed

- Power and telephone and street light poles
- Plan and profile drawing reference numbers
- Gas mains, underground hydro, telephone, street lights and cable and their related appurtenances
- Survey control monuments
- Routing of all major storm flows including the 100-year storm.

c) A Key Plan to a small scale, (e.g., 1:10000), showing the location of the works in relation to major streets, shall be provided in the upper right-hand section of the drawing sheet.

d) A drawing index shall be provided and include the drawing titles, sheet numbers, and the County drawing number.

e) Refer to Figure 2.1 for a sample Cover Sheet including the Site Plan and Key Plan.

3.1 – Plan and Profile Drawings - General

Each base plan and profile shall show but not be limited to the following information:

a) All cadastral information including property lines, right-of-ways, easement lines and dimensions in sufficient detail to relate design to surrounding and adjacent properties shall be included on all drawing submissions.

b) Legal description and civic addresses of existing properties.

c) Road allowance dimensions.

d) Existing pavement curbs, sidewalks, ditches, driveways, lanes, retaining walls, buildings, trees and shrubs within the right-of-way. Note significant trees on and within 5 metres of the right of way.

e) All existing underground and surface utilities and services (with offsets, elevations, size, age and material type and as-built references) including but not limited to the following:

- Sanitary sewers, storm sewers, watermains and appurtenances
- Street light poles, conduit and appurtenances
- Hydro poles and underground wiring ducts and appurtenances
- Telephone poles, underground wiring ducts and appurtenances and fibre optic cables
- Gas mains and appurtenances
- Cable television ducts and appurtenances
- Traffic control devices, poles, conduits, signs and painting
- Irrigation systems

f) All relevant topographic information. For slopes greater than 10 percent, one (1) meter contour lines are required.

g) Autodesk Project name, drawing and layout name in the bottom left hand corner of the title block.

h) Benchmark elevation, identification number and location shall be shown in the appropriate section of each title block.

i) Right-of-way and/or road centreline stationing shall be to metric standards (0+000) at 20 metre intervals and shall be related geometrically to legal property lines or survey monuments. Stationing shall run left to right where possible and upstream on gravity pipes.

j) Where possible, plan views shall be horizontal across the drawing sheet, and shall be aligned vertically by centre line stationing with the profile view below.

k) Profile elevations shall be placed at both sides of the profile. Split profiles must show elevations on both sides of the break.

4.1 - Roads

The following shall be shown in addition to the information required in 3.1 Plan and Profile Drawings - General

a) All proposed roadworks, complete with offsets from road centerline, including: pavement, curbs, sidewalks and poles.

b) Stations of the BC & EC of road centreline and curb return horizontal curves together with the curve information including delta angle, radius, tangent length and arc length.

c) Details of intersections with spot elevations at all critical points including grades and elevations of curb returns.

d) Catchbasin rim elevations and stations related to road centerline chainage. To include lead locations to main, lead diameters and material in a table.

e) Existing ground profile and finished pavement profile along the pavement centerline with elevations at 20 metre intervals.

f) Crossfall or crown information with gutter elevations at change points.

g) Proposed road centreline grade.

h) Stations and elevations of BVC, EVC, and VPI.

i) Vertical curve information including the length of curve and sag or crest K value, where K equals the length of the vertical curve in metres divided by the algebraic difference in grades, percent.

j) Elevations along the vertical curve at ten (10) metre intervals.

k) Elevation and station of low and high spots of vertical curves.

l) Where the slope of existing ground is greater than 10% across the right-of-way, cross-sections shall be shown at intervals not exceeding twenty (20) metres.

m) Where there is an elevation difference of more than 1.2 m from the design road centre line to a suitable building site on the adjacent parcel, driveway grades and profiles shall be shown on the drawings.

n) Where only a half road is being constructed, full width design cross-sections shall be provided as required to ensure the design suits the future development of adjacent properties.

o) Typical road cross-section showing right-of-way width, proposed road design structure, pavement width, sidewalks, curbs, underground utilities, hydro, power and street light poles, hydrants and their related offsets.

p) Proposed and existing monument with label (note: no monuments shall be destroyed during construction).

q) Additional design details as required.

r) Refer to Figure 2.2 for a plan and profile sample drawing.

5.1 – Storm and Sanitary Sewers

The following shall be shown in addition to the information required in 3.1 Plan and Profile Drawings - General

a) Include common trench designs on the same construction drawing.

b) All proposed storm and sanitary works including manholes, drop pipes, cleanouts, catchbasins, inlet/outlet structures, pipe work, ditches, culverts, inspection chambers, services and wyes, complete with offsets, rim elevations, stations related to the road centreline, and pipe inverts at manholes and pipe grade breaks.

c) Existing ground profile and finished ground or pavement profile along the centerline of the proposed sewer.

d) Distance between manholes with proposed grade of pipe.

e) Stations and elevations of the BC, and EC of all horizontal curves with the curve information including delta angle, radius, tangent length and arc length.

f) Stations and elevations of BVC, EVC and VPI.

g) Vertical curve information including the length of vertical and maximum pipe deflection.

h) Elevations along vertical curves at ten (10) metre intervals.

i) Size, type and class of pipe.

j) Existing or proposed pipe crossings to be shown in profile and to include pipe inverts.

k) Proposed inverts and offset locations to property line of service connections at property lines.

l) Location of existing buildings on properties served by storm and sanitary sewers.

m) Additional design details as required.

n) Refer to Figure 2.2 for plan and profile sample drawing.

o) Materials, types, size, inverts and flow direction to be shown for all proposed and existing culverts.

6.1 - Water

The following shall be shown in addition to the information required in 3.1 Plan and Profile Drawings - General

a) All proposed waterworks including size, type and class of pipe, hydrants, valves, joint restraints, fittings and all related appurtenances with offsets and stationing related to road centreline.

b) Locations of proposed service connections including an offset distance from a survey marker or lot corner.

c) Existing ground profile and finished ground or pavement profile, and invert profile along the centerline of the proposed watermain.

d) All other service crossings to be shown in profile (e.g., sewer mains, gas mains, etc.).

e) Extent of work required in making the connection to existing watermains.

f) If the proposed watermain alignment or profile varies from the road centreline, the following shall be provided:

- Stations of the BC and EC of horizontal curves together with curve information including delta angle, radius, tangent length and arc length.
- Stations and elevations of the BVC, EVC and VPI of vertical curves together with curve information including curve length and maximum pipe deflection required.
- Elevations along vertical curve at ten (10) metre intervals.
- Proposed grades.

g) Pipes requiring joint restraints shall be shaded, labeled and dimensioned from adjacent fitting showing the length of pipe requiring restraint.

h) Additional design details as required.

i) Refer to Figure 2.2 plan and profile sample drawing.

7.1 – Street Lighting and Traffic Control Signals

The following shall be shown in addition to the information required for plan view in 3.1 Plan and Profile Drawings - General

a) Pole, conduit and appurtenances locations with offsets and stationing related to road centreline.

b) Size, type, class of conduits.

c) Schematics of wiring details for street lights and traffic signals.

d) Details of detector loops and all other wiring circuit on traffic signals.

e) Street lights shall be numbered and pertinent information, (i.e. wattage, lamp type, pole height and location, arranged in table format as per Figure 2.3)

8.1 – Signage and Pavement Markings

a) A separate plan shall be prepared in all cases for road surface works. This plan shall detail eradications, alterations, additions and new regulatory and advisory signage and lines painting.

The design shall conform to Ministry of Transportation Installation Guidelines. The following information shall be shown:

- Dimensions, lengths and colour of proposed lane or curb markings, medians, and crosswalks.
- Lane widths, median radii and taper ratios.
- Dimensioned location and type of new or relocated signs. Type of new, removed or relocated signs, including a sign inventory table.
- A signs materials list indicating pavement markings shall be arranged in table format and shown on Figure 2.3

b) For drawing clarity show curb locations only. Do not show utilities, legal information or addresses.

9.1 – Detail Sheet and Cross-sections

a) Where there is not sufficient room on the plan and profile drawings, design details for the particular drawing may be provided on a separate sheet.

b) Scale shall be determined by the designer to suit the design detail, and shall be included on the detail drawing.

c) Where road cross-sections are required they may be provided on a separate sheet.

d) Cross-sections shall be to a scale of 1:250 (H) to 1:100 (V) unless otherwise approved.

e) Starting at the lower left hand corner of the drawing sheet, cross-sections shall be placed up the sheet in order of increasing stationing. Grid elevations shall be shown at the left hand side of each cross-section and stationing shall be shown above each cross-section. Adequate space shall be left between cross-sections so as to ensure clarity.

f) Cross-sections shall include:

- Design road cross-section within the right-of-way.
- Existing ground cross-section extending into the adjacent properties as required.

10.1 – Land Acquisition

a) Where the proposed construction of capital works is over private lands and requires a right-of-way, a separate land acquisition drawing will be prepared for every lot affected.

b) The drawing will be on an 11x17 or 8-1/2 x 11 sheet of paper at a scale no less than 1:500.

c) The drawing shall include the legal lot information, adjoining properties and street names, and a north arrow.

d) The civic address and registered owners will be listed in the bottom right hand corner above the title block.

e) The plan will show the area of the proposed new right of way and of the total lot area through which the right of way will go.

f) A dimension perpendicular to the adjacent lot line and any other dimensions required to clarify the extent of the proposed right of way will be shown.

11.1 – As-built Submissions

a) Drawings shall include all information as specified elsewhere for the construction drawings, but shall be corrected upon completion of construction to note all works removed during construction. Note abandoned services and reflect As-Built conditions for permanent records.

b) All dimensions shown shall reflect the As-Built conditions of the construction and all references to "Proposed" ,"Install", etc. shall be removed. As-Built drawings shall be to scale in accordance with the As-Built dimensions shown. The revision table shall be completed indicating the drawings are As-Built.

c) All As-Built features shall be surveyed and survey points imported into the digital drawing. The As-Built drawing shall reflect the true elevation and location of all constructed features, in both the plan and profile views. Tolerance for moving features in drawings will be >1.0m (e.g. manholes installed less than 1.0m from design location do not need to be shifted on the digital as-builts/drawings).

d) The As-Built drawings shall be submitted in the following digital formats:

- Supported Acrobat PDF
- "AutoCAD Etransmit" Autodesk: AutoCAD Supported format or equivalent method to ensure transfer of all reference files, pen and Font styles.

e) Line work for all constructed works shown on the drawings shall retain the thicker line density (as for proposed works) for ease of determining the extent of works covered by the drawings.
Proposed construction for future phases of the project shall not be shown on the As-Built drawings.

f) All As-Built drawings shall include the following information as well as the required asset information as listed below:

- The location and elevation of all existing utilities and services encountered in the construction operation,
- The location and invert elevation at property line of all individual service connections, and the wye Chainage, at the main for all constructed and existing works,
- A note on each drawing describing the type of trench material (sand, gravel, clay, hard pan, etc.) encountered during construction and the location and profile of all rock.
- Complete Sanitary and Water Service Record Sheets for each lot

Pipe

- Diameter
- Material
- Manufacturer
- DR Rating
- Pressure Class / Series Pipe Number
- Size Class – CTS, DIPS, IPS
- Install Date

Valves

- Diameter
- Location
- Manufacturer
- Open Direction (Left / Right)
- Number of turns
- Type (i.e. gate, butterfly, etc.)
- Install Date
- Depth to nut if available (m)

Air Release

- Location
- Size
- Manufacturer
- Model
- Serial No.
- In Chamber (Y/N)
- Secondary Valves (Y/N) – No.of valves
- Drain Valve (Y/N)
- Distance – Valve to Watermain (m)

Hydrants

- Location
- Manufacturer
- Open Direction (Left / Right)
- Depth of Bury (m)
- Distance – Hydrant to Valve (m)
- Distance – Valve to Watermain (m)
- Flow at 140 kPa (L/s)

Oxford County

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SECTION 2 – ENGINEERING DRAFTING STANDARDS

FIGURES

Oxford County

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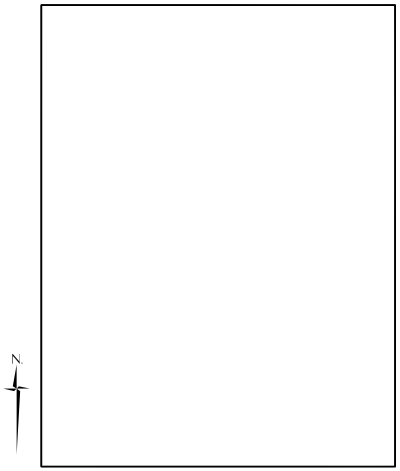
TYPE OF CONSTRUCTION
TITLE

PROJECT TITLE
MUNICIPALITY

CONTRACT No.

LIST OF DRAWINGS



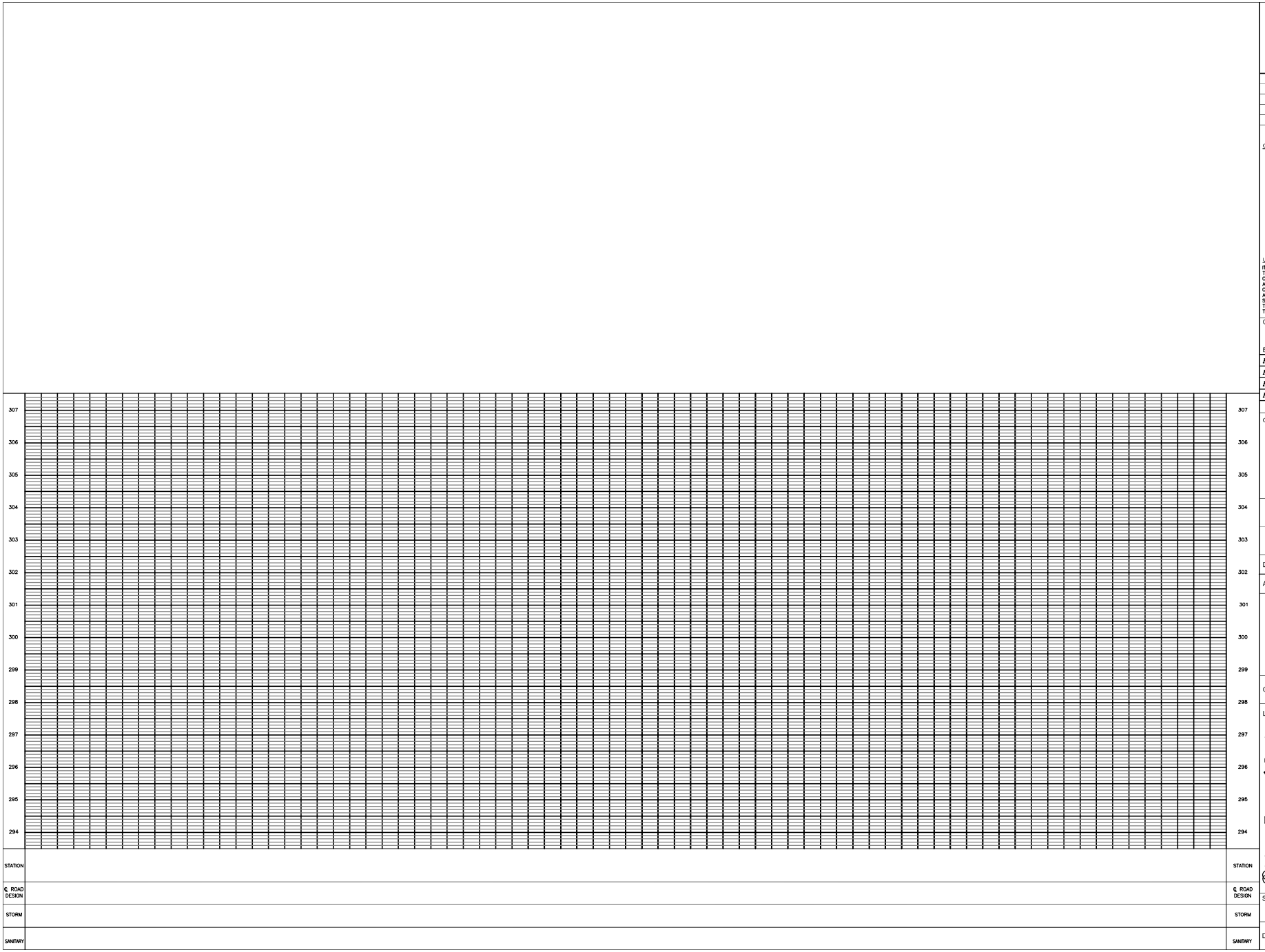
KEY PLAN

FIG 2.1

IT IS THE RESPONSIBILITY OF THE PLAN USER TO INFORM THEMSELVES OF THE EXACT LOCATION OF ALL POLES, LINES, CONDUITS, WATER MAINS, SEWERS, AND OTHER UNDERGROUND AND OVERHEAD UTILITIES AND STRUCTURES BEFORE COMMENCING THE WORK. SUCH UTILITIES AND STRUCTURES ARE NOT NECESSARILY SHOWN ON THE DRAWINGS. WHERE SHOWN THE ACCURACY OF THE POSITION IS NOT GUARANTEED. THE CONTRACTOR SHALL ASSUME ALL LIABILITY FOR DAMAGES TO THE UTILITIES DURING CONSTRUCTION.

CAD-OXFORD PUBLIC WORKS

DRWG.No.



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REVISIONS	No.	DATE	BY

GENERAL NOTES

UTILITY NOTE

IT IS THE RESPONSIBILITY OF THE PLAN USER TO INFORM THEMSELVES OF THE EXACT LOCATION OF ALL POLES, LINES, CONDUITS, WATER MAINS, SEWERS, AND OTHER UNDERGROUND AND OVERHEAD UTILITIES AND STRUCTURES BEFORE COMMENCING WITH WORK. SUCH UTILITIES AND STRUCTURES ARE NOT NECESSARILY SHOWN ON THE DRAWINGS. WHERE SHOWN, THE ACCURACY OF THE POSITION IS NOT GUARANTEED. THE CONTRACTOR SHALL ASSUME LIABILITY FOR DAMAGES TO THE UTILITIES DURING CONSTRUCTION

CONTROLLING B.M.

ELEV=

ISSUED FOR APPROVAL		
ISSUED FOR TENDER		
ISSUED FOR CONSTRUCTION		
ISSUED FOR RECORDS		
ISSUE BLOCK	BY	DATE

CONSULTANT

DESIGNED BY:

APPROVED BY:

DWN BY:

CHK'D BY:

DATE:

SCALE: HOR:
VERT:

CONTRACT No:

LEGEND

NO MH ACCESS
FLUSHING BWF(F.B.)
SANITARY MANHOLE
STORM MANHOLE
MANHOLE
CATCHBASIN
DOUBLE CATCHBASIN
INLET CATCHBASIN
FIRE HYDRANT
WATER VALVE
CURB STOP (CS)
HYDRO POLE
LIGHT STANDARD
TRAFFIC LIGHT
HANDWELL
GUY WIRE
HYDRO VAULT
TV/BELL PED.
GAS VALVE
SIGN
STUMP
SHRUB
CONIFEROUS SHRUB
DECIDUOUS TREE

CONIFEROUS TREE
HEDGE
IRON BAR (IB/SIB)
ROD AND CAP(RAC)
BENCHMARK(B.M.)
CUT CROSS(CC)
NAIL
STRUCTURE NUMBER(TYP)
UTILITY PIPE DIAMETER (mm)

GAS
BELL
WATER
SANITARY
STORM
HYDRO
LATERAL
ABANDON PIPE

Stn To

DWG No:

FIG 2.2

FORM PHM–125 2007–12

REVISIONS	DATE	ANALYST	DESCRIPTION OF REVISIONS	RECOMMENDED BY

MODIFIED:

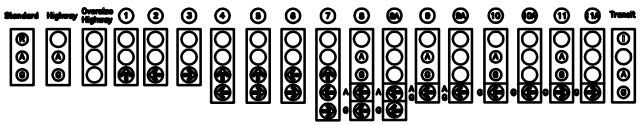
DRAWING NAME:
CREATED:

LEGEND

- HIGHWAY SIGNAL HEAD (30cm Red) WITH BACKBOARD AND MAST ARM
- HIGHWAY SIGNAL HEAD (30cm Red) WITH BACKBOARD AND OVERHEAD CABLE
- OVERSIZE HIGHWAY SIGNAL HEAD WITH BACKBOARD AND MAST ARM (ALL 30cm LENSES)
- SPECIAL HEAD WITH ARROW INDICATION AND BACKBOARD (Example shown Type ② Head)
- SPECIAL HEAD WITH BACKBOARD AND ONE OR MORE PROGRAMMABLE LENSES (Example shown Type ② Head)
- STANDARD SIGNAL HEAD WITH BACKBOARD AND MAST ARM (ALL 30cm LENSES)
- STANDARD SIGNAL HEAD WITH MAST ARM, WITHOUT BACKBOARD
- PEDESTRIAN SIGNAL HEAD
- PEDESTRIAN PUSH BUTTON

- VEHICLE PASSAGE LOOP DETECTOR
- VEHICLE LOOP DETECTOR
- DUPLEX LOOP DETECTOR
- DIAMOND LOOP DETECTOR
- MICRO–LOOP DETECTOR
- EMERGENCY VEHICLE PRE–EMPTION DETECTOR MICRO–WAVE DETECTOR
- TRAFFIC CONTROLLER
- TRAFFIC SIGN
- TRAFFIC SIGN WITH FLASHING BEACON
- ILLUMINATED TRAFFIC SIGN

TRAFFIC CONTROL SIGNAL HEADS
ALL 30cm LENSES, EXCEPT AS NOTED



⑧ ⑨ AMBER ARROW MUST BE USED IN A PROTECTED/PERMISSIVE SIMULTANEOUS LEFT TURN OPERATION.
NOTE: FOR SPECIAL ARROW HEADS ⑧, ⑨, ⑩ AND ⑪, 20cm AMBER BALL AND 20cm GREEN BALL LENSES SHOULD BE USED

CLASSIFICATION OF ROADWAY		TRAFFIC SIGNAL HEADS			LOCATION	
		TYPE	SIZE	BACKBOARD	MOUNTING HT.	OFFSET FROM POLE
ROADWAY _____		PRIMARY				
		SECONDARY				
		AUXILIARY				
MULTILANE ☐	SERVICE ACTUATED MOVEMENT	PRIMARY				
TWO–LANE ☐		SECONDARY				
ROADWAY _____		PRIMARY				
		SECONDARY				
		AUXILIARY				
MULTILANE ☐	SERVICE ACTUATED MOVEMENT	PRIMARY				
TWO–LANE ☐		SECONDARY				

MUNICIPALITY _____
INTERSECTION _____
DATE _____ SCALE _____
RECOMMENDED BY _____
MUNICIPAL OFFICIAL (MUNICIPAL INSTALLATION)
REGIONAL TRAFFIC REPRESENTATIVE (SENIORITY INSTALLATION)

MINISTRY OF TRANSPORTATION, ONTARIO
SIGNALS WARRANTED:
SIGNAL DESIGN RECOMMENDED FOR APPROVAL:
SIGNAL INSTALLATION APPROVED AS PER SECTION 144 (31) H.T.A.:
APPROVAL DATE:

FIG 2.3