



CITY OF WELLAND

INFRASTRUCTURE SERVICES

ENGINEERING DIVISION

CONSTRUCTION INSPECTION MANUAL

1.0 Original June 2009
1.1 Revised July 2011
1.2 Revised February 2013
1.3 Revised August 2015

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FORWARD

In accepting your assignment as a Construction Inspector for the Construction Services-Engineering Division, Engineering, Public works and Transportation Services Department of the City of Welland, you take on certain duties, obligations, and responsibilities.

Your **DUTY** is to inspect and to clearly and concisely record all the work undertaken while the project is under construction, and to ensure the construction is completed as per the intent of the design drawings. At times you may also be required to assist with the initial pre-engineering surveys and other project related duties as requested by the construction supervisor.

Your **OBLIGATION** is to ensure the project is constructed with quality, in accordance with contract documentation and amendments thereto. In relation to the terms QA / QC (Quality Assurance / Quality Control), you are providing the QA.

Your **RESPONSIBILITY** is to properly represent yourself, the Department, and your employer to all persons on the construction site and provide an important link between the contractor, the City and the residents. You must be aware of continuing events on the construction site, and as such, forecast progress, and anticipate problem areas and present solutions to avoid same.

To achieve these ends, this manual is prepared to establish the groundwork of uniformity and guidance for a Construction Inspector.

Quality Assurance (QA) is defined as the systematic monitoring and evaluation of the various aspects of a project, service or facility to maximize the probability that minimum standards of quality are being attained by the production (in this case, construction) process.

QA cannot absolutely guarantee the production of quality products - this requires the dual role of Quality Control (materials and product testing) and Quality Assurance.

Two principles of QA are: "**Fit for Purpose**" and "**Right the First Time**". While inspecting the work, ask yourself these two questions:

- (1) Is the product/method be suitable for the intended purpose?
- (2) Will this product/method stand the test of time?

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CONSTRUCTION INSPECTION MANUAL

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GENERAL DUTIES

The following is an overview of duties required of the Construction Inspector when inspecting City of Welland tendered construction projects:

1.1 Contract Documents

- Obtain a copy of the contract documents (specifications, drawings, geotechnical report, and addenda) as awarded by City Council. Note that the relevant sections of the Niagara Peninsula Standard Contract Document (NPSCD), and the Ontario Provincial Standard and Specifications (OPSS's), and Drawings (OPSD's), all of which are referenced by the contract documents. Pertinent OPSS and OPSD's should be obtained prior to start of construction. In regard to the above, you shall also:
 - (a) Review the documents and become thoroughly familiar and understand them.
 - (b) Become familiar with the general and special (or supplementary) conditions of the contract; as well as set forth rights, responsibilities and relationships of all parties involved.
 - (c) Become aware of the precedence settings to sections of the contract documents as listed within same.
- Obtain a second set of construction drawings to be used only for "as constructed" mark up.

1.2 Pre-Construction Duties

- Attend the pre-construction meeting. Be aware of the status of documents to be processed prior to the start of construction, including but not limited to those items identified in the minutes of the meeting.
- Dispense construction notifications to affected residents/proprietors prior to construction and when required. During construction - prior to tree removal and service disruption.
- Assist with layout for the construction project.

1.3 Construction Duties

- Be on the project site to inspect, observe, and record construction progress. This may require extended working hours in order to inspect contractors effort to complete a particular phase of construction.
- Contract Administrator is to be notified prior to leaving construction site for an extended period of time.
- Maintain open communication with all parties involved on the project.

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- Conduct yourself in a professional manner at all times and properly present yourself on behalf of the City to everyone involved in the project.
 - Keep in mind that the general public is ultimately the owner of the project and you are to be courteous at all times regardless of the circumstances. Any queries or concerns from the public (local residents as well as those travelling through) must be investigated promptly and recorded in the project inspection binder.
 - Attend site meetings as required by either the City or the Contractor, and obtain a copy of minutes of those meetings and review same.
 - Ensure there are no deviations between construction and contract documents. Major additions or deletions from contract must be approved by the Contract Administrator.
 - Look ahead for possible construction problems and forward concerns and possible solutions to the Contract Administrator.
 - If it becomes necessary for the Construction Inspector to provide advisement to the Contractor, it is to be done in the best interest of the City. This shall include notifying of the following:
 - a) noncompliance of contract and standard City requirements and practices prior to contractor's progress from that stage of work
 - b) proficient methods to accomplish phases of tasks, resulting in strict adherence to project requirements
 - c) approved amendments, additions and deletions to the contract
 - Bring to the contractor's attention any obvious safety infractions and note same in the inspection diary. In the event correction is not made to infraction, the construction inspector is to notify the Contract Administrator who may follow up with the Ministry of Labour as required.

1.4 Safety & Equipment

- Be aware of the Contractors safety arrangements to allow for proper inspection. For example: traffic control, trench shoring and egress, confined space safety requirements, etc.
- Be attired and equipped in a professional manner in accordance with the Occupational Health and Safety Act for the field conditions which may be encountered under any given situation. Be conscientious of your own safety.
- Have proper equipment as may be required for a particular project, such as, but not limited to:
 - a) communication device (blackberry / cell phone)
 - b) digital camera

- c) hand level
 - d) survey level and rod
 - e) tape measure
 - f) engineering scale(s)
 - g) office supplies, such as: paper, pen, pencil, highlighters, straight edge, clipboard, etc.
 - h) calculator
- If any particular equipment is not available, the Construction Inspector shall obtain same from City Stores or advise your Supervisor.
 - Do not participate in the actual construction activities of the contractor. The Construction Inspector may advise the contractor of their opinion on how to perform a task but not actually perform it or direct contractor of same.
 - The Contract Administrator shall be notified should you feel it is necessary to issue a stop work order.
 - Schedule survey and/or layout crews (if applicable) and/or material testing technicians when project requires. May assist survey and layout crews as required.

1.5 Record Keeping

- Examine, quantify, and record relevant material and equipment brought to the site to determine its conformance with the shop drawings and contract documents.
- Accurately and neatly complete and/or maintain reports, summary sheets, change orders, correspondence, photographs, samples, etc., and any other project related forms from time to time as required. City forms are to be used, as applicable, and all are to be submitted to the Contract Administrator in a timely manner for the purpose of appropriate action and/or information record keeping.
- Update construction progress on the construction schedule and notify the Contract Administrator of impending time related problems.
- Prepare progress quantities for payment purposes at the interval set at the pre-construction meeting and submit to the Contract Administrator for processing at the end of each month of work.
- Submit daily time summaries, and weekly timesheets. Copies of Daily Inspection Reports are to be provided to the Contract Administrator as requested.
- Provide the Contract Administrator with a deficiency list related to the construction project prior to the contractor leaving a site and again prior to the release of the maintenance holdback.

1.6 Breaks

- Take two fifteen minute coffee breaks, and one thirty minute lunch breaks per the Collective Agreement, at times convenient and appropriate as it relates to the work.

1. INSPECTION DUTIES

1.1 Preamble

This briefly outlines inspection requirements of the resident inspector through the various stages of City of Welland construction projects. The duties listed are the minimum requirements and a particular project or circumstance may warrant additional requirements.

A written log of each point and/or construction phase may not be required if adherence to the contract is followed, or otherwise noted on construction drawings. However, a visual recognition is necessary to ensure contract obligations are met.

1.2 Measurement for Payment

On a daily basis, or as practical, the Construction Inspector shall track payment quantities in terms of measurement units and methods.

When applicable, estimate approximate percentage of completion for items payable by “Plan Quantity Payment” (PQP) as specified in the contract.

1.3 Extras

Major construction items not provided for in the contract require the following:

- Approval by the Contract Administrator
- Log of machinery and manpower - type and time - used directly for the extra
- Record of materials used for the extra
- Record of quantities for the extra
- Ratification of above three items by contractor’s representative by the end of the working day
- Submission of ratification to the Contract Administrator
- Ratification of standby versus working time.

1.4 Traffic Control Inspection

- Traffic Control concerns should be brought to the Contractors attention and if necessary to the Contract Administrators attention.
- Be aware of truck routes for material haulage
- Road closures must be approved in advance
- Be familiar with Ontario Traffic Manual (OTM) Book 7 - Temporary Conditions
- Be aware of the Contractors requirement to have prepared and on site a Traffic Control Plan. Where appropriate, receive copies of the Traffic Control Plan and submit to the Contract Administrator for review.

1.5 Layout Inspection

Although the Construction Inspector is not generally responsible to perform the layout, they must be aware of the following:

- Horizontal and vertical alignment including laser grades, string lines, batter boards, and boning rods
- Appurtenances offsets, such as, water valves, hydrants, manholes and catch basins
- Vertical alignment of string lines, batter boards, grade sheets, boning rods and grade sheets
- Review of layout prior to construction to determine potential conflicts.
- Co-ordinate additional layout as required

1.6 Trenching Inspection

- Sawcut requirements
- Depth and width of excavation
- Bedding and cover placement and compaction
- Backfill placement and compaction
- Document when major pipe/appurtenance and other utilities are encountered including (ownership/size/type/station/depth) and method of support prior to backfilling
- Granular delivery and quantity
- Trench support. Contractor to be advised if proper trench support is not being used, such as lack of trench box.
- Contact Geotechnical Engineer for compaction tests

1.7 Materials Inspection

- Appearance, characteristics and quality of existing subgrade
- Designation, source and quality of imported materials (granular, engineered fill)
- Designation, source and temperature of asphalt materials
- Connections and/or butting of adjoining materials
- Placement and/or installation
- Arrange for and co-ordinate materials quality testing as required.

1.8 Sewers and Appurtenances Inspection

- Vertical and horizontal alignment
- Location of connections
- Tee locations (also required for services)

- Size and type of pipe used
- Manholes including benching, parging, connections to sewers, proper frame and cover, ladders and safety grating
- Catch-basins including location of connections, sump depth, and frame & cover
- All construction works to be tied into layout for as-built purposes and to include actual invert elevation of sewers.
- In high water levels use of dewatering methods

1.9 Sanitary Service Laterals Inspection

- Enforce tracing of existing lateral locations (by Contractor) to determine ‘future’ tee location
- Log of sweeps/bends, or risers used
- Size and type of pipe used
- Direction of connections
- Clean-out per City Drawing No. S-32
- Horizontal, vertical and grade documenting of service lateral
- Complete City of Welland Sanitary Sewer Service Lateral Sheet for each lateral installation, sample sheet included in the Appendix to this document.

1.10 Watermains and Water Service Inspection

- Ensure compliance with latest copy of Watermain Specifications and Operating Procedures
- Size and type of pipe
- Location and configuration of mechanical restraints, and secondary thrust blocks
- Elbow, bend, tee, valve, hydrant, etc., locations
- Alignment
- Separation from sewers
- Measurement and record of depths (bedding, cover, clearance at utilities)
- Complete City of Welland Water Service Record form for each water service as well as hydrant and valve forms, samples included in the Appendix to this document. Submit documents to CAD staff so that this information can be entered into the City’s computer system making it available to Public Works Staff
- Submit our computer system for Public Works staff to access
- Conduct and document chlorine residual testing for water quality assurance and submission of same to the City’s Water Quality Department
- Inspection of all materials for compliance with the “lead free” NSF 61 requirements

- Arrange with Water Quality department for quality testing and co-ordinate same
- Proper completion of Daily Inspection forms, sample include in the Appendix to this document.

1.11 Roadway/Sidewalk Construction/Reconstruction Inspection

- Marking out construction limits e.g.: milling limits and sidewalk/curb removals
- Depth of milling or pulverizing
- Compaction and condition of sub grade
- Compaction, depth, material type and grading of granular base
- Material type, depth and compaction of asphalt
- Forms for concrete works
- Type, depth and compaction of bedding for concrete work
- Proper location of expansion joints for concrete works.

1.12 Safety Inspection

- Be aware of applicable Ministry's guidelines and requirements
- Contract Administrator to be notified, as required
- Document any safety concerns brought to the Contractor's attention
- Be aware of traffic - vehicular and pedestrian
- Be aware of end of day safety
- Contract Administrator to be notified of all safety concerns not addressed by the Contractor; these safety issues to be rectify immediately

1.13 General Construction Site Inspection

- Material delivery and storage location
- Portable facilities location
- Contractor's site office location
- Excavation and backfill cleanliness
- Road wear and condition
- Access to utility stations (hydrants/telephone boxes/etc.)
- Access to bus shelters, sidewalks, driveways, businesses etc.

1.14 Reinstatement Inspection

- Proper drainage
- Address ratepayer's concerns
- Request and schedule meeting as required

- Sod reinstatement including topsoil depth, rolling and sod placement
- Asphalt reinstatement – depth, rolling and placement as per City Standards

2. CONSTRUCTION DOCUMENTATION

2.1 Preamble

The assigned construction inspector to City of Welland tendered construction projects shall make written reports of construction progress. The reports are to be presented in a professional fashion and each page shall contain the project name, date, contractor, inspector's name, inspector's consulting firm - if applicable, and inspector's signature, sample attached in Appendix A. When forms are used for reports, all fields on the form are to be completed in detail.

An inspection binder will be prepared for each construction project and be provided to the assigned construction inspector. The following is a list of forms contained in the inspection binder, which are to be regularly completed as applicable:

- Log of Contractor's/Subcontractor's Manpower
- Log of Contractor's/Subcontractor's Equipment and Machinery
- Daily Construction Inspection Reports
 - Work Progress and Remarks shall include: location of work (ie. station, elevation, depth etc.), sketches, discussions with contractor, accidents, etc.
- Reports of Possible Extra Work
 - Shall include Work Progress and Remarks of work 'out of contract' subject to extra payment
- Working Day Summary Sheet
- Quantity Summation
- Daily Quantity Sheets
- Quantity Measurements Sheets as required
- Deficiency List
- Sanitary Sewer Service Lateral Sheets
- Water Service Records
- Water Valve Sheets
- Hydrant Sheets
- Water Quality Sheets

Copies of these forms are to be provided to the Contract Administrator. If documentation is in digital format, it is to be backed up on the City's server on a minimum weekly basis in accordance with the Contract Administrator's requirements. Hard copies of manual and completed paperwork to be provided to the Contract Administrator on a regular basis.

The above list does not limit inspector's documentation. Other paper work may be required, such as, inspector's own generated forms or provided forms from time to time.

Also to be maintained with the documentation is:

- Weight scale slips orderly bound daily and separated by type of material
- Dated photographs as warranted, saved to an appropriate file, with locations and remarks prior to construction, during construction and after construction
- Samples of materials as warranted, and
- A clean and neatly kept set of contract plans clearly updated to represent as constructed conditions (Copy to be provided to the Contract Administrator).

3. SUBDIVISIONS

3.1 Roles and Responsibilities

Construction in Subdivisions is completed through a subdividers agreement between the developer and the City. Therefore, even though at the time of construction the land is considered private, the agreement provides the necessary enforcement that the services are to be built in accordance with the current Municipal Standards.

Subdivisions are financed solely by the developer, and as such your time spent inspecting the subdivision is recovered through deposits made at the time the agreement is made.

The developer's engineer will perform the general inspection duties on subdivisions. Your role is to ensure watermain construction is done in accordance with the Municipal Standards, as well to perform duties only permitted by a licensed water operator in order to ensure water quality is maintained.

With the above in mind, specific duties include (but are not limited to):

- Daily Construction Inspection Reports
 - Work Progress and Remarks shall include: location of work (ie. station, elevation, depth etc.), sketches, discussions with contractor or engineer, etc.
- Deficiency List
- Water Service Records
- Water Valve Sheets
- Hydrant Sheets
- Watermain Testing as per City's Standard Operating Procedures

Layout, quantities, payments, geotechnical information and as-constructed drawings are the responsibility of the developer's engineer.

3.2 Commissioning and Final Acceptance

Commissioning of the watermain (i.e. connection to the distribution system) will only be permitted once BOTH of the following conditions have been met:

- Watermain testing has passed (and the connection window has not yet expired), and
- As-constructed drawings, hydrant sheets and valve sheets have been submitted and are acceptable; information to be entered into the City's computer system making it accessible to Public Works staff.

4. SITE PLAN DEVELOPMENTS

4.1 Roles and Responsibilities

Site plan construction is performed on private property (i.e. not in the right-of-way, nor on subdivisions) under the authority of the Ontario Building Code.

Due to heightened regulations concerning the risk of contamination to the water supply from contractors working on site plan construction, particularly where backflow provisions are not in place, inspection for construction integrity and water quality is to be performed on waterworks components equal to or larger than 100mm in diameter. All other inspections are performed by the City of Welland Building Division.

Watermain materials and construction methods shall be as indicated on the drawings. Furthermore, where reference on the drawings indicate that material and construction must correspond to current specifications of the Municipality, the materials and appurtenance specifications prepared by the City are to be adhered to (copy of these specifications can be found at <http://www.welland.ca/Eng/Reports.asp>).

With the above in mind, specific duties include (but are not limited to):

- Daily Construction Inspection Reports
 - Work Progress and Remarks shall include: location of work (ie. station, elevation, depth etc.), sketches, discussions with contractor or engineer, etc.
- Deficiency List
- Water Service Records
- Water Valve Sheets
- Hydrant Sheets

Layout, quantities, payments, geotechnical information and as-constructed drawings are the responsibility of the developer's engineer.

- Watermain testing as per City's Standard Operating Procedures

4.2 Commissioning and Final Acceptance

Commissioning of the watermain (i.e. connection to the distribution system) will only be permitted once BOTH of the following conditions have been met:

- Watermain testing has passed (and the connection window has not yet expired), and
- As-constructed drawings, hydrant sheets and valve sheets have been submitted and are acceptable; this information will be entered into the City's computer system making it accessible to Public Works staff.

APPENDIX A

DAILY CONSTRUCTION INSPECTION REPORT

Contractor;		Equipment:	Labour:
Work Order #;			
Working Day No.;			
Date;			
Temperature;			
Weather;			
Working Hours;			
Project Name;			

WORK PROGRESS AND REMARKS

Inspector Print Name	Cert. #	Signature
Supervisor Print Name		Signature

CITY OF WELLAND INFRASTRUCTURE SERVICES

ENGINEERING DIVISION

REPORT OF EXTRA WORK

PROJECT NAME:

CONTRACT NUMBER(S): 0

WORKING DAY NUMBER:

DATE:

TEMPERATURE:

WEATHER:

CONTRACTOR:

WORKING HOURS:

SUBCONTRACTOR:

WORKING HOURS:

SUBCONTRACTOR:

WORKING HOURS:

EQUIPMENT AND MACHINERY

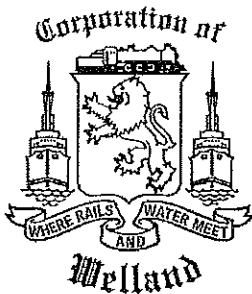
MANPOWER

Area with horizontal dashed lines for reporting details.

IN-FIELD RATIFICATION

CONTRACTOR'S REPRESENTATIVE (PRINT NAME) - TITLE - SIGNATURE

INSPECTOR - TITLE/CONSULTANT - SIGNATURE



City of Welland

Working Day Summary Sheet

Project Number: ENG _____

Project Name: _____

Name of Contractor: _____

Number of Working Days (Original Contract): _____ Days

Extension of Contract Time: _____ Days

Revised Contract Working Days: _____ Days

Date	Working Day	Site Activities
Mon. _____, 20__		
Tues. _____, 20__		
Wed. _____, 20__		
Thurs. _____, 20__		
Fri. _____, 20__		

Total Working Days This Week (A)

Working Days this Week (A): _____ Days

Previous Weeks Total (B): _____ Days

Current Working Day Status (A+B): _____ Days

Date: _____

Signed _____

Inspector

Signed _____

Contractor's Representative

OPSS GC 1.04: Working Day means any Day,

except Saturdays, Sundays and statutory holidays;

except a Day as determined by the Contract Administrator, on which the Contractor is prevented by inclement weather or conditions resulting immediately therefrom, from proceeding with a Controlling Operation. For the purposes of this definition, this shall be a Day during which the Contractor cannot proceed with at least 60% of the normal labour and Equipment force effectively engaged on the Controlling Operation for at least 5 hours;

c) except a Day on which the Contractor is prevented from proceeding with a Controlling Operation, as determined by the Contract Administrator by reason of,

i. any breach of the Contract by the Owner or if such prevention is due to the Owner, another contractor hired by the Owner, or an employee of any one of them, or by anyone else acting on behalf of the Owner.

ii. non-delivery of Owner supplied Materials.

iii. any cause beyond the reasonable control of the Contractor that can be substantiated by the Contractor to the satisfaction of the Contract Administrator.

APPENDIX B

Work Order ID# _____

CITY OF WELLAND SEWER LATERAL RECORD

Spot Repair Full Replacement New Lateral Installation Record

Street: _____ Building No.: _____ Depth: At Main _____ m, PL _____ m

Pipe Size/Material (Main Sewer to Property Line): _____ mm, PVC, VC, AC, Transite

Pipe Size/Material (Private Portion): _____ mm, PVC, VC (Clay), AC, Transite, Pitch Fibre

Pipe Length (Main to Property Line): _____ m, (From Front Wall to Main) _____ m

Size & Material of Main Sewer: _____ mm, PVC, VC, AC, Transite, Concrete

Date Installed/Repaired: _____ By: _____

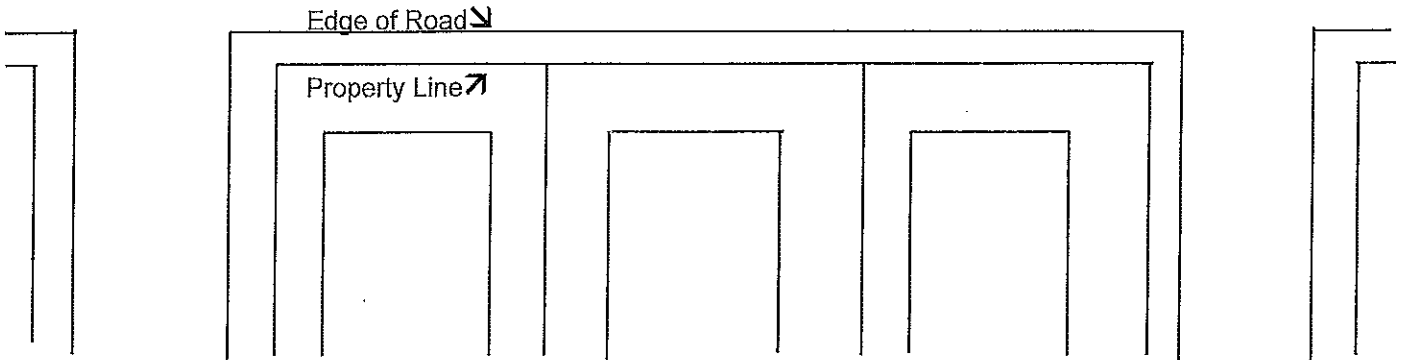
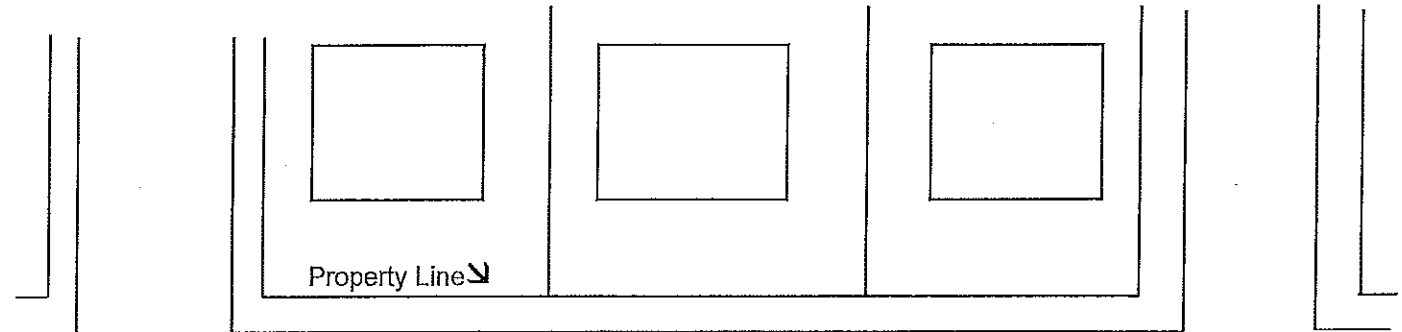
Approximate Fall: _____ mm Cleanout or Pipe Location: Distance to Building: _____ m

Distance to Manhole: _____ metres Distance Side of Building: _____ m Direction: _____ to _____

Manhole in Front of House No.: _____ Distance from Sidewalk: _____ m

Remarks (Describe Work Done): _____

(Sketch to include, nearest manhole, house number(s) street name(s), show measured location of new lateral, main sewer and anything that may be important to you in the future).



Work Order ID # _____

Corporation of the City of Welland
WATER SERVICE INSTALLATION RECORD

Replaced Lead

Establishment: _____ Street: _____ Building No. _____

Record Update Service Repair Service Replacement New Service Installation

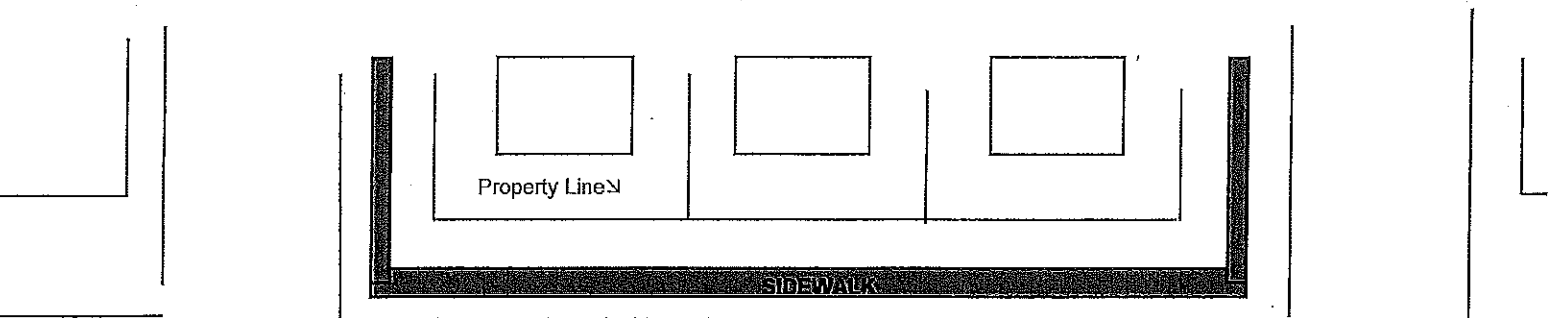
Service off same street or _____ No. Of Services for Prop./Bldg.: _____

City Service Pipe						Private (Homeowner's) Service Pipe					
Total Length (W/M to CB): _____ (m)											
From Main Stop (WM) Toward Curb Box at Prop Line			Material Change Prior to Curb Box			Material Change From Curb Box at Property Line			From Curb Box toward Building		
Length of Material (m)	Size (mm)	Material	Length of Material (m)	Size (mm)	Material	Length of Material (m)	Size (mm)	Material	Length of Material (m)	Size (mm)	Material

Date Installed:	Depth (Cover) of Service at Property Line: _____ (m)
Installed by: (Pipefitter)	Anode Type:
Inspected by: (Foreman/Leadhand)	Anode Installation Date:

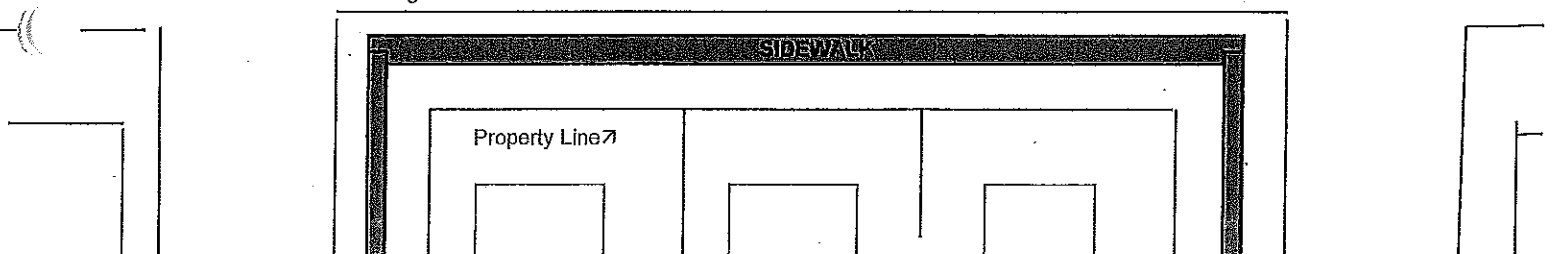
	Distance from Sidewalk (m)	Distance from Building (m)	Distance from Side of Building (m)	Direction	Tap	Reference Station	Reference Station Location/Remarks:
Curb Box							
Main Tap							

Date Measured: _____ Measured by: _____
Remarks: _____



Edge of Road ↴

Edge of Road ↴



City of Welland

Hydrant Record Update

Certified Operator Print: _____ Side (North/South/East/West)
 Certified Operator Sign: _____ Corner (NW / NE / SW / SE)
 Hydrant ID(or Chainage): _____

Location (Street): _____ Work Order: _____
 Intersecting Street: _____ Today's date: _____
 In front of House(s) Number: _____

<u>Hydrant Data</u>		Yes	No
Date of Installation/Repair/Replace: _____	Break-away Flange: _____	/	
Ownership: _____ (City/Region/Private)	Drain Hole Open: _____	/	
Zoning: _____ (Residential/Commercial/Institutional)	Pumper Outlet (115mm): _____	/	
Make: _____	# of Nozzle Outlets (65mm): _____		
Model: _____	Height (ground-Pumper): _____		
# of turns to cycle: _____	Depth of Bury: _____		
Direction to Open: _____ (Left/Right)	Barrel Size: _____		

<u>Hydrant Colour</u>	
Dome: _____ (Blue/Green/Orange/Red)	Hydrant Marker: _____
Cap: _____ (Green/Silver)	(Yes/No)
Barrel: _____ (Red/Yellow)	No Branch Valve _____

<u>Branch/Secondary Valve Data</u>	
Valve Make: _____	Valve to Hydrant Offset: _____ m
Box Type: _____	Direction of Valve to Hydrant: _____
Chamber Size: _____	(North/South/East/West)
# of turns to cycle: _____	Valve Position: Open Closed Throttled (circle one)

<u>Hydrant Service Lead Data</u>	
Diameter: _____ mm	Materials of lead: _____
Length: _____ m	(PVC/AC/CI/Oversized)
Mainline Diameter _____	Material: _____
	Connection type @ main _____
	(Anchor Tee/Tee)

<u>Flow Test Calculation</u>	
1. Flow from pitot chart:	
Static () _____ -20=	Factor from Chart: _____ (B)
Static () -Residual () =	Factor from Chart: _____ (C)
Flow @ 20 psi:(A) _____ x (B) _____ / (C) _____ =	
Colour of Dome: _____	
(0-499 Red)(500-999 Orange)(1000-1499 Green)(1000+Blue)	

Hydrant Spacing

Distance (m)	To Nearest Hydrant ID	Street or to Dead End Street	Comments

Street/Address#: _____ Work Order Number: _____

CITY OF WELLAND WATER DEPARTMENT

- Valve Plated
- Valve Removal
- Valve Repair
- Valve Replacement Existing Valve Number: _____
- New Valve Installation New Valve Number: _____
- New Blow Off and Valve Installation
- No Previous Measurements in Valve Book (Existing Valve)
- Include Measurements in Curb Box Book (Service Only)
- Record Update (Incorrect Measurements)

Principal Street: _____ Meters _____ of Hydrant# _____

Intersecting Street: _____ Meters _____ of Hydrant# _____

Date of Replacement/Installation: _____

Date of Repair: _____

Valve Size: _____ millimeters Depth to Nut: _____ meters

- | | | | |
|-----------|--|--------------------------|--|
| Valve in: | <input type="radio"/> Valve Box | Type of Box | <input type="radio"/> Cast Iron |
| | <input type="radio"/> Chamber | | <input type="radio"/> Plastic |
| Is Valve: | <input type="radio"/> Main Line | Is Valve a Gate Valve | <input type="radio"/> Yes <input type="radio"/> No |
| | <input type="radio"/> Service | If Not Then What Type: | _____ |
| | <input type="radio"/> Service with Meter | | |
| | <input type="radio"/> Fireline | Number of Turns to Open: | _____ |
| | <input type="radio"/> Hydrant | Direction to Open | Left <input type="radio"/> Right <input type="radio"/> |

- | | |
|--|---|
| <input type="checkbox"/> Replace Packing | <input type="checkbox"/> Replace T-Bolts on Valve |
| <input type="checkbox"/> Replace Bolts on Packing | <input type="checkbox"/> Replace Operating Nut |
| <input type="checkbox"/> Replace Bolts on Bonnet (lower bolts) | |

Make of Valve: _____ Type of Joint: _____

Crew: _____

Comments:
.....
.....

Work Order ID# _____

Corporation of the City of Welland
SAMPLE STATION INSTALLATION/REPAIR RECORD

Establishment: _____ Street: _____ Building No. _____

Record Update Station Repair Station Replacement New Station Installation

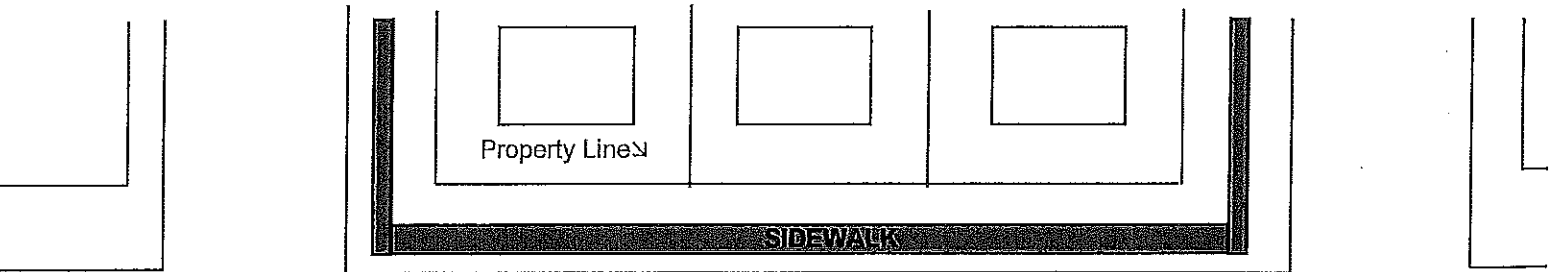
Service off same street or _____

City Station Pipe						All Parts Installed	
Total Length (W/M to CB): _____ (m)						<input type="checkbox"/> Yes	
From Main Stop (WM)			Material Change Prior to			<input type="checkbox"/> No	
Toward Curb Box at Prop Line			Curb Box				
Length of Material (m)	Size (mm)	Material	Length of Material (m)	Size (mm)	Material		

Date Installed: _____	Depth (Cover) of Service at Property Line: _____ (m)
Installed by: (Pipefitter)	Anode Type: _____
Inspected by: (Foreman/Leadhand)	Anode Installation Date: _____

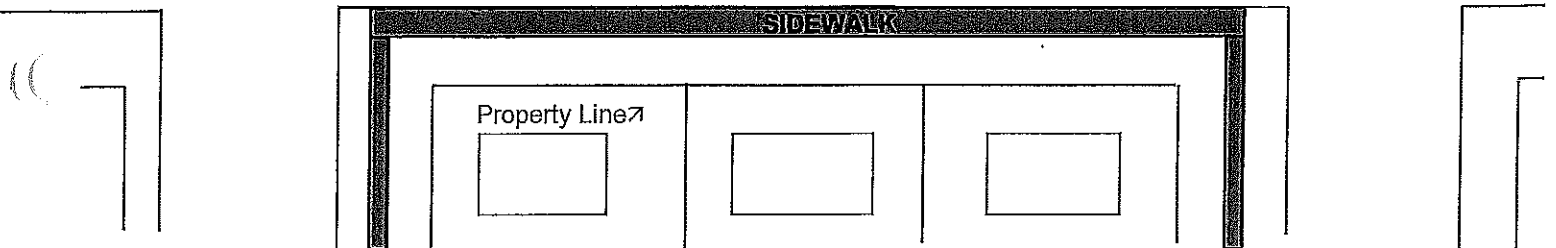
	Distance from Hydrant (m)	Distance from (m)	Hydrant ID	Tap	Reference Station	Reference Station Location/Remarks:
Curb Box						
Main Tap						

Date Measured: _____ Measured by: _____
Remarks: _____



Edge of Road ↗

Edge of Road ↘



APPENDIX C

NEW WATERMAIN DISINFECTION AND TESTING CHECKLIST

Project Name: _____ **Work Order Number:** _____
Project Address: _____ **Contract Administrator:** _____
Contractor: _____ **Construction Inspector:** _____
Site Supervisor: _____ **Inspector Certificate #:** _____
Sample Location(s): _____

Procedure Step	Approval Date	Inspector or Contract Administrator's Signature	Results / Comments
1. Sampling Plan (Attached):			
2. Swabbing (# Swabs):			
3. Hydrostatic Pressure Test (150 psi for 2hrs):			
4. Chlorine Residual (Initial, min. 50 ppm):			
5. Chlorine Residual (After 24 hrs, min. 25ppm):			
6. Chlorine Residuals Normalized? (Post Flushing):			
7. Background Samples Taken:			
8. Bacteriological Test #1 - 24hrs - (Sample Taken):			
9. Bacteriological Test #1 - 24hrs - (Results Received):			
10. Bacteriological Test #2 - 48hrs - (Sample Taken):			
11. Bacteriological Test #2 - 48hrs - (Results Received):			
12. Watermain Commissioning Date:			

**CITY OF WELLAND
WATERMAIN PRESSURE AND LEAKAGE TEST**

F-085
Rev. 1
13/07/16

PROJECT NAME: _____

STREET NAME: _____

FROM: _____ TO: _____

TEST PERFORMED BY: _____

DATE: _____ TIME: _____

CONTRACTOR: _____

FOREMAN: _____ WORK ORDER NO: _____

Test shall be performed as per OPSS 701.07.22 Hydrostatic Testing.

Test pressure shall be maintained at 1,035 kPa. (150 psi) for a two hour period.
The allowable leakage is 0.082 litres per millimeter of pipe diameter per kilometer of watermain per two (2) hour test.

$$0.000082 \times \frac{\text{Pipe Diameter (mm)}}{\text{Watermain Length (m)}} = \frac{\text{Allowable Leakage (two hour period) (litres)}}{\text{Watermain Length (m)}} \quad \text{(A)}$$

Allowable drop in reservoir drum during test:

$$0.00127 \times \frac{\text{Allowable Leakage (two hour period) (litres)}}{\text{Tank Diameter (m)}} \div \left(\frac{\text{Tank Diameter (m)}}{\text{Tank Diameter (m)}} \right) = \frac{\text{Depth of water Drop (m)}}{\text{Tank Diameter (m)}}$$

$$785.398 \times \frac{\text{Tank Diameter (m)}}{\text{Tank Diameter (m)}} \times \frac{\text{Tank Diameter (m)}}{\text{Tank Diameter (m)}} \times \frac{\text{Depth of Water Added During Test (m)}}{\text{Tank Diameter (m)}} = \frac{\text{Measured Leakage (two hour period) (litres)}}{\text{Tank Diameter (m)}} \quad \text{(B)}$$

TEST RESULTS:

$$\frac{\text{Allowable Leakage (two hour period) (A) (litres)}}{\text{Tank Diameter (m)}} - \frac{\text{Measured Leakage (two hour period) (B) (litres)}}{\text{Tank Diameter (m)}} = \frac{\text{Difference (litres)}}{\text{Tank Diameter (m)}}$$

Positive = Pass
Negative = Fail

RESULTS: PASSED: FAILED:

REMARKS: _____

Contractor's Signature: _____

Inspector's Signature: _____



CHLORINE RESIDUAL TEST FORM

Work Order No.: _____
 Activity Code: _____
 Function: _____

LOCATION: _____

Time of Testing	Sample Temp.C	Chlorine Free (mg/l)	PH	Turb. (FAU)	Action Taken
-----------------	---------------	----------------------	----	-------------	--------------

Sample 1

Sample Taken By:						
Location Description / Address:			Date of Test:			
Appurtanance #			Meter Reading Start			
Flushing Start Time:			Meter Reading End			
End Time:			Volume Flushed			
Valve Open Percentage:			Flushing Nozzle Size:	mm		

Sample 2

Sample Taken By:						
Location Description / Address:			Date of Test:			
Appurtanance #			Meter Reading Start			
Flushing Start Time:			Meter Reading End	° C		
End Time:			Volume Flushed			
Valve Open Percentage:			Flushing Nozzle Size:	mm		

Sample 3

Sample Taken By:						
Location Description / Address:			Date of Test:			
Appurtanance #			Meter Reading Start			
Flushing Start Time:			Meter Reading End	° C		
End Time:			Volume Flushed			
Valve Open Percentage:			Flushing Nozzle Size:	mm		

Sample 4

Sample Taken By:						
Location Description / Address:			Date of Test:			
Appurtanance #			Meter Reading Start			
Flushing Start Time:			Meter Reading End	° C		
End Time:			Volume Flushed			
Valve Open Percentage:			Flushing Nozzle Size:	mm		

Sample 5

Sample Taken By:						
Location Description / Address:			Date of Test:			
Appurtanance #			Meter Reading Start			
Flushing Start Time:			Meter Reading End	° C		
End Time:			Volume Flushed			
Valve Open Percentage:			Flushing Nozzle Size:	mm		

Actions:

1	
2	
3	
4	
5	

NOTE: If any reading is below 0.05 mg/L Free Chlorine, Notify Water Quality personnel IMMEDIATELY of adverse situation.
 The City of Welland's Distribution System Free Chlorine Residual should be maintained above a 0.20 mg/L. If readings are detected below this value, please notify water quality staff.

Completed by: _____ Date: _____

APPENDIX D

29 TRAFFIC CONTROL

Attention: Supervisors

Traffic control persons (TCPs) must be given written and oral instructions regarding their duties. This section is designed to help you meet the requirement for written instructions set out in Section 69(4) of the Construction Regulation.

A worker who is required to direct vehicular traffic,

- (a) shall be a competent worker;*
- (b) shall not perform any other work while directing vehicular traffic;*
- (c) shall be positioned in such a way that he or she is endangered as little as possible by vehicular traffic; and*
- (d) shall be given adequate written and oral instructions, in a language that he or she understands, with respect to directing vehicular traffic, and those instructions shall include a description of the signals that are to be used.*

In addition, the written instructions must be kept on the project.

What are the objectives of traffic control?

- To protect construction workers and the motoring public by regulating traffic flow.
- To stop traffic whenever required by the progress of work. Otherwise to keep traffic moving at reduced speeds to avoid tie-ups and delays.
- To allow construction to proceed safely and efficiently.
- To ensure that public traffic has priority over construction equipment.

What equipment do I need?

Personal

- Hard hat that meets regulated requirements.
- Safety boots, CSA-certified, Grade 1 (green triangular CSA patch outside, green rectangular label inside).
- Garment, usually a vest, covering upper body and meeting these requirements:
 - fluorescent or bright orange in colour
 - two vertical yellow stripes 5 cm wide on front, covering at least 500 cm²
 - two diagonal yellow stripes 5 cm wide on back, in an X pattern, covering at least 570 cm²
 - stripes retro-reflective and fluorescent
 - vests to have adjustable fit, and a side and front tear-away feature on vests made of nylon.

We recommend that garments comply with CSA standard Z96-02—and in particular a Class 2 garment, Level 1 or Level 2.

Sign

A sign used to direct traffic must be

- octagonal in shape, 450 mm wide, and mounted on a pole 1.2 m long
- made of material with at least the rigidity of plywood 6 mm thick
- high-intensity retro-reflective red on one side, with STOP printed in high-intensity retro-reflective white

- 150 mm high
- on the other side, high-intensity retro-reflective micro-prismatic fluorescent chartreuse, with a black diamond-shaped border at least 317 mm x 317 mm, with SLOW printed in black 120 mm high.

After Dark

Section 69.1(4) of the Construction Regulation requires that you wear retro-reflective silver stripes encircling each arm and leg, or equivalent side visibility-enhancing stripes with a minimum area of 50cm² per side.

The following measures are recommended:

- Wear a hard hat with reflective tape.
- Use a flashlight with a red cone attachment as well as the sign and carry spare batteries.
- Place flashing amber lights ahead of your post.
- Stand in a lighted area under temporary or street lighting, or illuminated by light from a parked vehicle (stand fully in the light without creating a silhouette).

What are the requirements of a good traffic control person?

- Sound health, good vision and hearing, mental and physical alertness.
- Mature judgment and a pleasant manner.
- A good eye for speed and distance to gauge oncoming traffic.
- Preferably a driver's licence.
- The ability to give motorists simple directions, explain hazards, and answer questions.
- Liking, understanding, and respect for the responsibilities of the job.

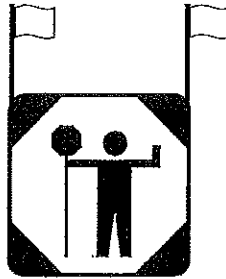
How do I prepare for each job?

Before starting work, make sure that you know

- the type of construction you will be involved with — paving, installing pipe, grading, cut and fill, etc.
- the type of equipment to be used, such as scrapers, trucks, compactors, and graders
- how the equipment will be operating — for instance, crossing the road, along the shoulder, in culverts, or on a bridge
- whether you will have to protect workers settling up components of the traffic control system such as signs, delineators, cones, and barriers
- any special conditions of the contract governing road use (for instance, many contracts forbid work during urban rush hours)
- how public traffic will flow — for example, along a two-lane highway, around curves or hills, by detour or on a road narrowed to a single lane. This last is a very common situation and requires two traffic control persons to ensure that vehicles do not move in opposing directions at the same time (see next page). In some cases, where the two cannot see one another, a third is necessary to keep both in view and relay instructions (see "Positioning of Traffic Control Persons," next page).

What should I check each day?

- Make sure that the STOP-SLOW sign is clean, undamaged, and meets height and size requirements.
- Place the TRAFFIC CONTROL PERSON AHEAD sign at an appropriate distance to afford motorists adequate warning.
- Remove or cover all traffic control signs at quitting time or when traffic control is temporarily suspended.
- Arrange with the supervisor for meal, coffee, and toilet breaks.

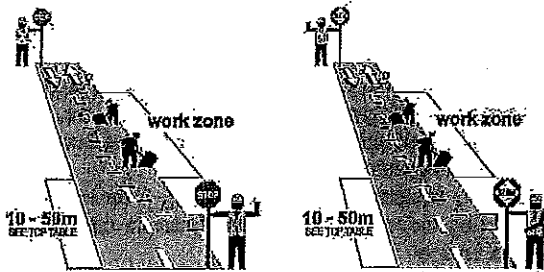


Where should I stand?

- Stand the correct distance from the work area. Refer to TCP Table on the following page.
- Do not stand on the travelled portion of roadway and always face oncoming traffic.
- Be alert at all times. Be aware of construction traffic around you and oncoming traffic on the roadway.
- Stand alone. Don't allow a group to gather around you.
- Stand at your post. Sitting is hazardous because your visibility is reduced and the ability of a motorist to see you is reduced.

TCP TABLE

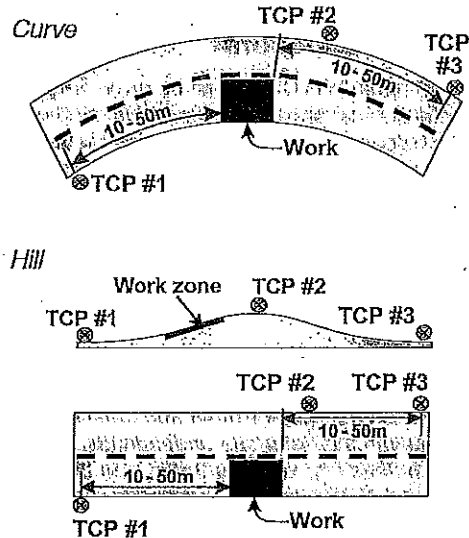
POSTED SPEED	60 km/h OR LESS, ONE LANE OR REDUCED TO ONE LANE IN EACH DIRECTION		70 km/h TO 90 km/h, ONE LANE OR REDUCED TO ONE LANE IN EACH DIRECTION	
	LOW	HIGH	LOW	HIGH
TRAFFIC VOLUME	LOW	HIGH	LOW	HIGH
DISTANCE OF TCP FROM WORK ZONE	10 - 15 m	20 - 30 m	30 - 40 m	40 - 50 m



Typical Arrangement on Two-lane Roadway

- Adjust distances to suit road, weather and speed conditions. Remember these points:
 - Traffic must have room to react to your directions to stop (a vehicle can take at least twice the stopping distance on wet or icy roads).
 - Stand where you can see and be seen by approaching traffic for at least 150 metres (500 feet).
 - Avoid the danger of being backed over or hit by your own equipment.
- Hills and curves call for three TCPs or some other means of communication. The job of the TCP in the middle is to relay signals between the other two.

Positioning of Traffic Control Persons



Note: On curves and hills, three TCPs or some other means of communication are required. The duty of TCP #2 is to relay signals between TCP #1 and #3.

- Once you have been assigned a traffic control position by your supervisor, look over the area for methods of escape — a place to get to in order to avoid being injured by a vehicle heading your way, if for some reason the driver has disregarded your signals. If this should happen, protect yourself by moving out of the path of the vehicle and then warn the crew.

Where am I not allowed to direct traffic?

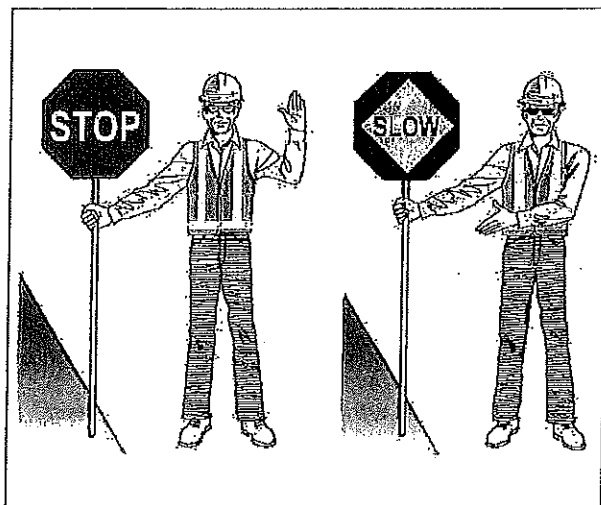
Section 69 of Ontario Regulation 213/91 specifies that:

A worker shall not direct vehicular traffic for more than one lane in the same direction. s. 69(2)

A worker shall not direct vehicular traffic if the normal posted speed limit of the public way is more than 90 kilometres per hour. s. 69(3)

How should I signal?

- Use the STOP-SLOW sign and your arms as shown below.



- Hold your sign firmly in full view of oncoming traffic.
- Give the motorist plenty of warning. Don't show the STOP sign when the motorist is too close. The average stopping distance for a vehicle travelling at 50 kilometres per hour (30 miles per hour) is 45 metres (150 feet). Higher speeds require more stopping distance.
- When showing the SLOW sign, avoid bringing traffic to a complete halt. When motorists have slowed down, signal them to keep moving slowly.
- When showing the STOP sign, use firm hand signals and indicate where you want traffic to stop. When the first vehicle stops, step into the centre of the road so the second vehicle can see you.
- Before moving traffic from a stopped position, make sure the opposing traffic has stopped and that the last opposing vehicle has passed your post. Then turn your sign and step back on the shoulder of the road.
- Stay alert, keep your eyes on approaching traffic, make your hand signals crisp and positive.
- Coordinate your effort with nearby traffic signals to avoid unnecessary delays, tie-ups, and confusion.
- Do not use flags to control traffic.
- In some situations, two-way traffic may be allowed through the work zone at reduced speed, with a traffic control person assigned to each direction. Since motorists can be confused or misled by seeing the STOP side of the sign used in the opposite lane, the signs must be modified. The STOP side must be covered to conceal its distinctive shape and command. This should prevent drivers from stopping unexpectedly.

How can I improve safety for myself and others?

- Don't be distracted by talking to fellow workers or passing pedestrians. If you must talk to motorists, stay at your post and keep the conversation brief.
- When using two-way radios to communicate with another traffic control person, take the following precautions:
 - Establish clear voice signals for each situation and stick to them.
 - Be crisp and positive in your speech.
 - Test the units before starting your shift and carry spare batteries.
 - Avoid unnecessary chit-chat.
 - Don't use two-way radios in blasting zones.
- When two traffic control persons are working together, you should always be able to see each other in order to coordinate your STOP-SLOW signs. Signals between you should be understood. If you change your sign from STOP to SLOW or vice-versa, you must signal the other person by moving the sign up and down or sideways. This will ensure that traffic control is coordinated. Two-way radios are the best way of communicating.

When you can't see the other traffic control person, a third should be assigned to keep you both in view.

What are my rights under the law?

Additional requirements for traffic control are spelled out in the *Ontario Traffic Manual, Book 7: Temporary Conditions*, available through Service Ontario Publications (1-800-668-9938). Ask for item number 170076. It can also

be downloaded for free from www.mto.gov.on.ca through a library search for the Ontario Traffic Manual.

The information applies to traffic control by any persons or agencies performing construction, maintenance, or utility work on roadways in Ontario.

The Construction Regulation under the *Occupational Health and Safety Act* makes it mandatory that traffic control persons be protected from hazards. This includes not only personal protective clothing and equipment but measures and devices to guard against the dangers of vehicular traffic. Safety should receive prime consideration in planning for traffic control. Regulations under the *Occupational Health and Safety Act* are enforced by the Ministry of Labour.

Traffic control persons have no authority under the *Highway Traffic Act* and are not law enforcement officers. If problems arise, follow these steps.

- Report dangerous motorists to your supervisor.
- Keep a pad and pencil to jot down violators' licence numbers.
- Ask your supervisor for assistance from police in difficult or unusual traffic situations.
- Never restrain a motorist forcibly or take out your anger on any vehicle.
- Always be alert to emergency services. Ambulance, police, and fire vehicles have priority over all other traffic.

Remember

- Always face traffic.
- Plan an escape route.
- Wear personal protective clothing.
- Maintain proper communication with other traffic control persons.
- Stay alert at all times.
- Be courteous.

Traffic control is a demanding job, often a thankless job, but always an important job. How well you succeed will depend largely on your attitude.