

# City of Ontario, California

## In-Tract Fiber Optic Network Design



December 2014

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## 1.0 In-tract Network Architecture

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In order to develop a system that is future proof as well as economically feasible, the City has adopted a home-run style network that will feed back through the development to Active Electronics at the entrance of the development. This system will generally be constructed utilizing a 2" "Trunk Line" that will run to various hand-holes where splicing will occur. Once spliced, the necessary fibers will be delivered to the residential unit via ¾" conduits and flower pots where applicable. This architecture will require appropriate Optical Network Terminals (ONT) at the residential unit, capable of receiving these signals and converting them to a useable system within the household.

Generally, it is anticipated that at the entrance of the subdivision (or multiple points depending on size and layout of the project) there will be a hand-hole that will hand off the fiber from the back-bone to the tract. At this location, a future pad needs to be identified (in concept, but provide approximate location and stationing), which will need to be constructed to house active electronics; however, this will be something that will be installed in the future. From the hand-hole that hands off the fiber to the in-tract, a minimum of a single 2" trunk conduit will need to be run throughout the subdivision. For every 144 homes (and 288 fibers) another 2" conduit will be required (eg., a subdivision with 200 homes will require 400 fibers and 2-2" conduits through a portion of the development).

Splices will be accomplished in City approved handholes and handed off to each home, thus as one traverses the subdivision, one will continually find stranded fiber (fiber that has no signal because it is not contiguous). From each splice location, the fiber shall be routed directly to the residential unit (multi-pack developments, non-traditional SFR) or to a flower pot that is shared between two residential units (traditional SFR, alley loaded product with traditional street frontage, etc). Flower pots will be placed on the property line 5-feet back from the street right-of-way. The intent is to hand off two dedicated fibers to each residential unit; thus, if there are 144 homes in a development, then there will need to be 288 fibers terminated at the head of the tract.

It shall also be noted that only standard fiber cables will be allowed. These standards are 2,6,12,24,30,36,48,60,72,96,108,132,144,216,and 288. This will be discussed further in later sections of this document.

## 2.0 IMPROVEMENT PLAN DESIGN CRITERIA

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Engineered drawings, otherwise known as plans, submitted by private design engineers (the "ENGINEER") to the CITY for plan check shall adhere to these In-Tract Fiber Optic Design Guidelines whenever the plans involve the installation of new conduits in accordance with the CITY Fiber Optic Master Plan or along any local residential street, where fiber optic conduit is required to connect to the homes.

The submitted plans will be checked by the CITY for conformance with the CITY's standards and policies, and for overall acceptability of the proposed design. The following guiding documents are to be used by the ENGINEER in preparing the plans (in accordance with current CITY requirements, including building codes, electrical codes, etc.). Other pertinent documents may include Specific Plans, Master Plans, and the Conditions of Approval for the project.

Appendix B.1 of this document contains a "Fiber Optic Design Submittal Checklist" that must be fully filled out by the ENGINEER and included with the submitted plans as part of the submittal package. Other plans pertinent to the installation of Fiber Optic conduits (i.e. Public Infrastructure Plans) shall also be provided with the plans submitted for review.

It is the responsibility of the ENGINEER to be knowledgeable in dry utility design, and to complete a thorough quality assurance/quality control (QA/QC) review of the plans for errors BEFORE submitting them to the CITY for plan check. Plans submitted with numerous designs and/or drafting errors, drafted with poor quality workmanship, or missing significant information will be rejected and returned, without review.

Plans being re-submitted for a second or subsequent check shall include a new set of plans, the previous set of plans containing the CITY's red lines and comments, the design submittal checklist and any other items that document any comments that have been exchanged between the ENGINEER and the CITY.

Any and all submittals that do not contain all of the required components as identified in these guidelines are subject to rejection, and may be returned for correction without being reviewed. The ENGINEER should contact the CITY Engineering Department to determine whether there are any special requirements for a project.

## 2.1 Drafting Standards

All plan sheets submitted shall be 24 inches by 36 inches with the standard CITY title block (in accordance with CITY's Standard Drawing No. 6004). Unless requested, title sheets are not required. No sticky backs or paste-ons will be accepted. At the time of the final submittal, copies of the drawings created shall be provided in CAD format (.dwg, .dxf) to the CITY on a CD, DVD, or other acceptable digital media storage used at that time. All drawing submittals shall utilize an "e-transmit" feature and include any reference drawings, plot files and text files as necessary. Signatures must be "wet-originals" on the final submittal (Mylar).

Projects shall have a complete, master set of General Notes, Construction Notes, and/or Legend of Special Symbols for the whole project on the first sheet of the set. Subsequent project sheets shall require only those Construction Notes, and/or Legend of Special Symbols applicable to that sheet. In no case should a Construction Note or Symbol be defined differently on separate sheets of the same project. Undefined, nonstandard symbols shall not be used.

Reference to other drawings shall be made using the CITY assigned drawing number only. If a drawing number has not yet been assigned, leave a blank space. Drawing numbers will not be assigned until the CITY requests originals.

Stationing of the fiber optic system shall be per the assigned street stationing. Stationing shall increase west to east *or* south to north except where the street ends in a westerly or southerly dead-end or cul-de-sac.

All surface features (existing and proposed) such as meter boxes, power poles, sidewalk, drive approaches, signs, striping and markings, catch basins, gutters, signal equipment, street lights, trees, etc., must be shown.

In those cases, where a project spans multiple jurisdictions, a signature block for each affected agency shall be included on the title page and on each page where there is shared jurisdiction on the project. All jurisdictional boundary lines must be shown on the plans.

All drawings are required to show a north arrow above the plan scale in the lower right hand corner of the drawing, oriented toward either the top or the right side of the drawing. North arrows shall be consistent with the type used as a CITY standard (in accordance with CITY Standard Drawing No. 6003) at said time.

Short dashed lines are to be used when indicating existing equipment and improvements or are planned to be installed by another plan sheet. Solid lines, even if drawn narrower, can be erroneously construed as requiring installation of items that may currently exist.

All submitted plans shall be produced by ink-plotting, or by other permanent print methods. Sepia Mylar prints will not be accepted.

## 2.2 Fiber Optic Plan Standards

The following standards shall be applied to all Fiber Optic Plans:

- The scale of the plans shall be 1"=40' or 1"=20' depending on the complexity of the plan and clarity.
- The drawing title shall list the name of the street upon which the fiber is located on and the limits within the street (i.e. X-Street to Y-Street.)
- Fiber Optic plans are identified by "O-..." drawing numbers.
- All utilities must be shown.
  - If applicable, indicate possible conflicts with irrigation systems, street light systems, and/or other utilities. Identify corrective action to be taken by Contractor should damage occur.
- Where Fiber Optic improvements exist, or are proposed on private property (behind ROW line) indicate existence of, or need for, encroachment and maintenance easements. Appropriate easements must be provided prior to approval of plans for private developments. Pertaining to CITY projects, acquisition will be coordinate with CITY personnel.
- All dimensions for street(s), lane width(s), and utility location(s) are to be provided between centerline and curb.
- It is the design engineer's responsibility to ascertain and provide for minimum clearance requirements between the fiber optic conduit and all other utilities, railroads, easements, etc. All clearances shall be in accordance with CAL/OSHA, PUC and other jurisdictional agencies that are involved.

### 3.0 In-tract Design Criteria

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As with the back-bone fiber network, generally, in-tract trunk conduits shall be placed on the north or east side of the street. The maximum sized fiber cable to be placed in-tract shall be 288 fibers. Should the fiber count exceed 288 fibers, either a second access point shall be designed **OR** a second trunk fiber shall be installed (thus, there could be instances where more than a single 2" conduit traverses the neighborhood). Conduits shall be placed in joint trenches where possible. Trunk line conduits should be joint trenched with street lights where possible (parallel to the street centerline). Laterals or crossings can be joint trenched with other dry utilities. In no case should trunk line conduits be joint trenched with private dry utilities.

When submitting plans, the design engineer shall submit plans for the conduit system. Even though the City will not be installing fiber cable at this time, it is still the responsibility of the design engineer to verify the conduit system will function based on these design guidelines as well as current technologies.

The designer shall be responsible to try to minimize the amount of splice points. Generally, the City will require the designer to consider placing standard cable denominations to each location. Standard accepted fiber optic cable denominations will be: 2, 6, 12, 18, 24, 30, 36, 48, 60, 72, 84, 96, 108, 132, 144, 216, 288. Each home shall have 2-fibers to it; however, only 1 will be active. The other will be a spare fiber.

Splicing shall occur along the trunk fiber, and be done in a 17"X30" handhole (HH-2). Once a splice occurs, the fibers can be distributed across the street to a 13"X24" (HH-1). If fibers are running to traditional single family residential, this shall be accomplished in a 3/4" conduit from the HH-2/HH-1 to a flower pot on the property line. For every two homes (where the home layout allows), a flowerpot shall be installed on the PL, 5-feet back from the right of way. From the flower pot, a 3/4" conduit shall be run to the side of each house to the Customer Premise Equipment Box.

In the case of multi-pack development (or "Cluster" type developments), there will be no flower pot provided. A 3/4" conduit shall be supplied to each unit of a multi-pack development along the alley. This will occur directly from the HH-2/HH-1.

In the case of multi-family developments, a conduit shall be provided to each building, appropriately sized to provide 2-fibers to each unit. For example, a 30-unit apartment complex would require 60-fibers, so the designer will be responsible to propose this along with the appropriately sized conduit.

Figure A-1 of Appendix "A" demonstrates several ways that fiber optic conduits should be distributed. This include several different type of residential units including Single Family Residential and multi-pack ("Cluster") type developments.

## 4.0 Materials

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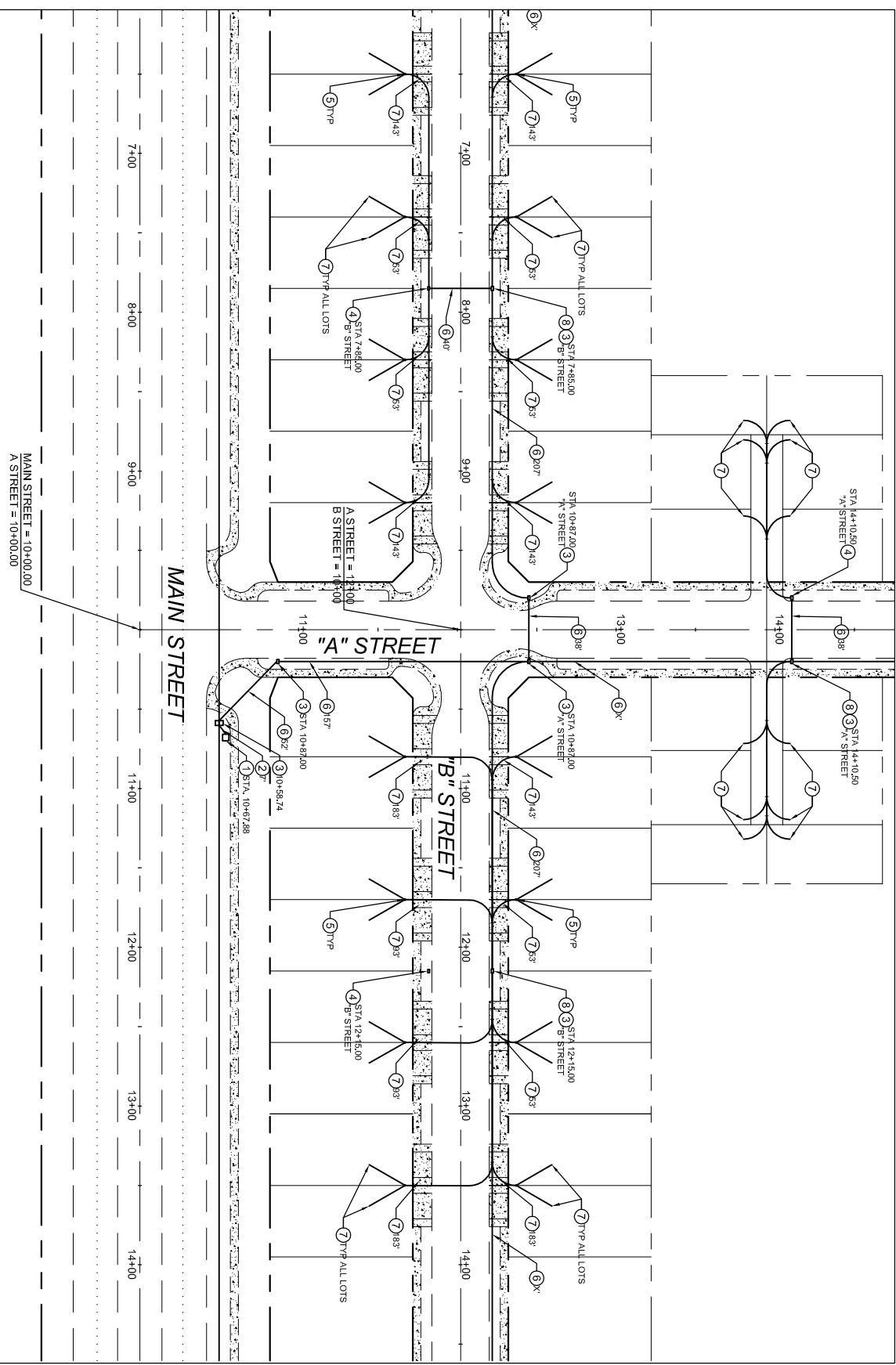
The following section is to provide standardization for the types of materials to be provided for each in-tract fiber optic design:

- Conduits shall be HDPE Smoothwall SDR-11 and sizes indicated in these guidelines. The pipes shall be tone-able and shall include a copper conductor within the wall of the pipe.
- Hand holes and flower pots shall be in accordance with the City Standard Drawing No. 1316.
- All equipment within the housing unit, including the Customer Premise Equipment Box, Network Communications Center and in-house wiring/conduits shall be in accordance with the City of Ontario Residential Structured Wiring Standards.
- Fibers called out for on the Fiber Cable Design Plan shall be standardized cables (as discussed) and shall be loose buffer tube and gel-free (see Corning's website for a sample of this type of cable, ALTOS Loose Tube, Gel-Free Cable).
- All splices shall be completed using industry standard splice enclosures.
- At splice locations, a minimum of 30-feet of slack cable shall be provided, and all other locations shall have a minimum of 15-feet of slack cable.



APPENDIX A  
FIGURES

FIGURE A-1: SAMPLE CONDUIT PLAN



- ① - FUTURE ACTIVE EQUIPMENT LOCATION
- ② - FUTURE 2" CONDUIT
- ③ - INSTALL HH-2 PER CITY OF ONTARIO STANDARD DRAWING NO. XXXX
- ④ - INSTALL HH-1 PER CITY OF ONTARIO STANDARD DRAWING NO. XXXX
- ⑤ - INSTALL HH-4P PER CITY OF ONTARIO STANDARD DRAWING NO. XXXX
- ⑥ - INSTALL 2" HDPE SDR-11 CONDUIT
- ⑦ - INSTALL 2" HDPE SDR-11 CONDUIT
- ⑧ - INSTALL 3" HDPE SDR-11 CONDUIT
- ⑨ - INSTALL SPURCE ENCLOSURE IN HANDHOLE

# CITY OF ONTARIO

## APPENDIX B DESIGN REVIEW CHECKLISTS

# CITY OF ONTARIO

## IN-TRACT FIBER OPTIC DESIGN SUBMITTAL CHECK LIST

	Item	Yes	No	N/A
1.	Plans are in ink on mylar sheets			
2.	Plan sheets are 24 inch X 36 inch with the Standard City Title Block			
3.	Plan scale is 1 inch equals 20 or 40 feet			
4.	Sticky backs or paste-on's are not used			
5.	Drawing title indicates the major street first and then the cross street (where applicable)			
6.	Construction notes and legends of special symbols are consistent throughout the project per City standards			
7.	Construction notes properly identify type of work to be done and only notes and legends applicable to a particular sheet are shown on that sheet			
8.	North arrow is in the lower right hand corner and is oriented toward the top or right of the drawing per City Std. Dwg. 6003			
9.	Drafting standards per City Std. Dwg. 6002 and 6003			
10.	Plans approved by Engineer with name of, RCE number, signature, address, and stamp			
11.	Existing surface features are shown and the correct line type used			
12.	Street names shown			
13.	Vicinity map correctly shown			
14.	Utilities are shown and identified			
15.	All street, lane widths, and utility line locations are dimensioned			
16.	Stations at beginning and end of improvements			
17.	Stations increase west to east or south to north except where the street ends in a westerly or southerly dead-end or cul-de-sac			
18.	Show all driveways existing and proposed			
19.	Show all existing improvements with dashed lines, show new improvements to be constructed with solid lines			
20.	Show right-of-way existing and proposed, and improvements with dimensions from centerline			
21.	Proposed and existing street lights, power poles, trees, fire hydrant, pipelines, irrigation lines, or structures, etc. in right-of-way or immediately adjacent to right-of-way must be shown and labeled. Call out the minimum horizontal separation between proposed fiber optic and other utilities			
22.	No trunk line conduits shall be allowed to encroach onto private property (unless an easement is provided)			
23.	Show lot lines per record maps			
24.	Fiber optic plans are identified by "O-" drawing numbers			
25.	Fiber optic handholes shall be called out per City Std. Dwg. 1316			
26.	The engineer shall attach a copy of the City of Ontario DAB Report page that			

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## IN-TRACT FIBER OPTIC DESIGN SUBMITTAL CHECK LIST

	calls out the requirements for the installation of street lights			
27.	Fiber optic conduits or handholes shall not conflict with traffic signal clear zone per City Std. Dwg. 5203			

It is the engineer's responsibility to assure that the proposed plan is in conformance with the above items prior to submittal to the City

Plans Submitted By: \_\_\_\_\_ Date: \_\_\_\_\_