



Fiber Optic Design – New Model Colony

NMC provides a unique fiber optic conduit construction opportunity as most Major, Residential and Collector streets have yet to be constructed. Within NMC, similar to the Old Model Colony, where applicable, trenching, joint trenching, and boring shall be used to install the Fiber Conduits and the previous reference Figures to be utilized. Fiber Optic conduit placement will generally be in a joint trench with Street Light conduits, placed behind the curb and under the sidewalk resulting conduit placement will be on the north side of street and the east side of street. It is acknowledged that upon full build out of NMC, conduit will be installed on both sides of the streets; however, for new street improvements, fiber optic conduits shall be placed as recommended above.

Fiber Optic Standards

All Fiber Optic Cable recommended within the Master Plan will be approved by the Engineering Department. The following are the general requirements and description and must be equivalent to the Fiber Optic Characteristics detailed listed in the Fiber Optic Master Plan supporting memorandum, Conceptual Layout of Needed Infrastructure Memorandum.

Singlemode Loose Tube Non-Armored

- Gel-Free/ Dry High Density Buffer Tubes
- Twelve (12) Fibers Per Each Buffer Tube
- Color Coded Buffer Tubes
- Jacketed Central Member
- Dielectric Strength Elements
- Outer Polyethylene (PE) Jacket
- Sequential Markings (Meters)
- Ripcord
- Meets ITU-T G.655 (2009)
- Follows ANSI/TIA/EIA



Conduit Standards

All Conduit recommended within the Master Plan will be approved by the Engineering Department. The minimum acceptable depth for fiber optic cabling / fiber optic conduits shall be 36". The following are the general design standards to comply with:

Primary Ring (PR)

- One (1) - 2" HDPE SDR-11 (Smoothwall) roll pipe (Orange) or equivalent
- Two (2) - 7 Way MicroDuct (Duraline) – 16mm Tubes or equivalent

Secondary Ring (SR)

- One (1) - 2" HDPE SDR-11 (Smoothwall) roll pipe (Orange) or equivalent
- One (1) - 7 Way MicroDuct (Duraline) – 16mm Tubes or equivalent

Laterals

- One (1) - 2" HDPE SDR-11 (Smoothwall) roll pipe (Orange) or equivalent
- One (1) - 7 Way MicroDuct (Duraline) – 16mm Tubes or equivalent

Handhole Placement

The fiber optic conduit infrastructure design will place and utilize five (5) different sized Handholes within the communication infrastructure and Handhole details can be found in CITY Standard Drawing No. **TBD**. Each Handhole has a unique use and placement, and the table below illustrates, based on fiber strand count, when each will be used:

Handhole Utilization - Fiber Strand Count

Table 7 – Handhole Utilization – Fiber Strand Count

Description	Fiber Strand Count
HH-FP	Less than or equal to 6 strands
HH-1	Less than or equal to 144 strands
HH-2	Less than or equal to 288 strands
HH-3	Less than or equal to 432 strands
HH-4	Greater than 432 strands



General Handhole Spacing Requirements

It is understood that as each project (Backbone / Lateral / Residential / In-tract) will require a unique design, so an exact standard will not fit the bill. Boxes along the backbone are generally placed every 500' to allow for pulling in the fiber and splicing to adjacent buildings and infrastructure.

Conduits sweeping into the Handholes shall enter in flush with the cut out mouse holes aligned parallel to the bottom of the box and come in perpendicular to the wall of the box. See Design Guideline Figure 6 for Handhole Conduit Entry. Conduits shall not enter at any angle other than near parallel. Sweeps from the mainline to the conduit shall be accomplished using radii recommended by the manufacturer -- see Design Guideline Figure 7 for details.

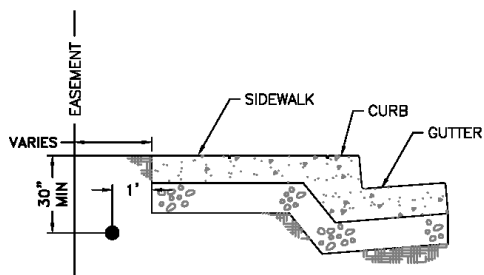
Bid Quality Standard Drawings & Specifications

The Fiber Optic Design Guidelines reference the following cross-sections drawings that are to be used in developing any Fiber Optic Construction Drawings.

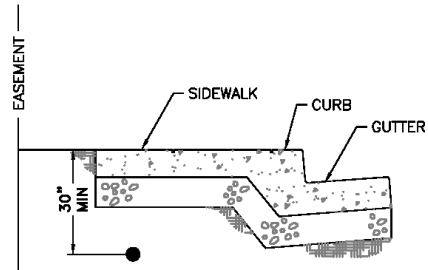


Directional Bore Detail

Design Guideline Figure 5 - Directional Bore Detail

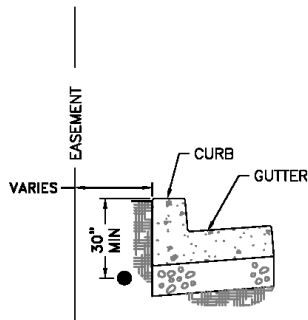


1 BORE BACK OF SIDEWALK
NOT TO SCALE

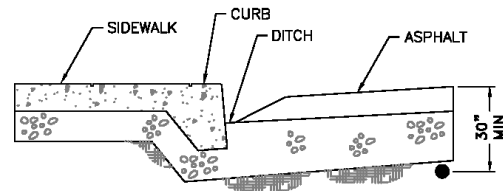


2 BORE UNDER SIDEWALK
NOT TO SCALE

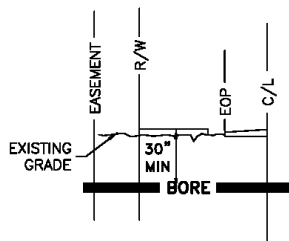
NOTE:
CONSTRUCTION CHOOSES THE APPROPRIATE
BORE LOCATION FROM THE OPTIONS ABOVE
BASED UPON FIELD CONDITIONS.



3 BORE BACK OF CURB
NOT TO SCALE



4 BORE UNDER ASPHALT
NOT TO SCALE

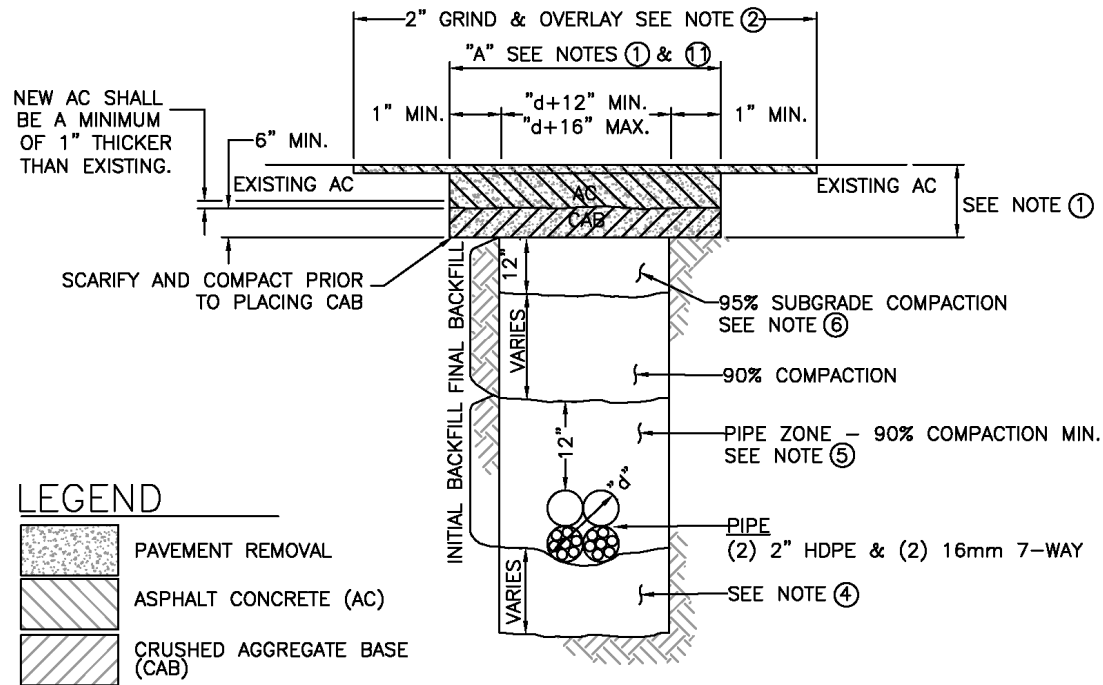


5 BORE ROAD CROSSING
NOT TO SCALE

REQUIRED BORE REAM SIZE	
NUMBER OF PIPES	REAM SIZE
(2) 2" HDPE & (2) 16mm 7-WAY	8"
(1) 2" HDPE & (2) 16mm 7-WAY	6"
(1) 2" HDPE & (1) 16mm 7-WAY	6"

Install two (2) 2" HDPE and two (2) 7-way (16mm) MicroDuct in accordance with CITY Fiber Optic Design Guidelines. Trenching shall be per CITY Std. 1306.

Design Guideline Figure 2 – Primary Ring Plus (+) 2” Duct (PR+2’')





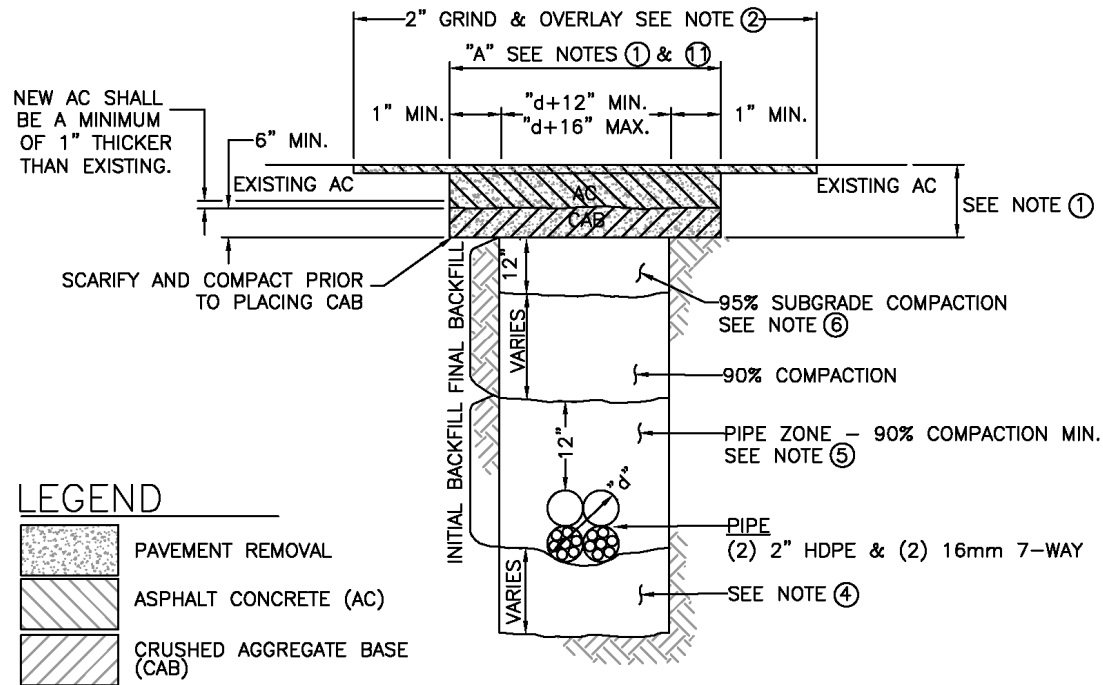
Trench Detail Notes

- ① EXISTING PAVEMENT SHALL BE WHEEL CUT OR SAW CUT & REMOVED AT THE WIDTH OF DIMENSION "A". THE DEPTH OF THE REMOVAL SHALL BE THE FULL STRUCTURED DEPTH PLUS THE NECESSARY EXCAVATION FOR THE NEW PAVEMENT SECTION AS REQUIRED BY NOTE 9 HEREON.
- ② FOR LONGITUDINAL TRENCHES OVER 150' IN LENGTH, A MINIMUM 10' WIDE, 2" GRIND AND OVERLAY IS REQUIRED.
- ③ THE PIPE ZONE WIDTH SHALL BE A MINIMUM OF 12" PLUS THE PIPE DIAMETER AND THE MAXIMUM OF 16" PLUS THE PIPE DIAMETER, IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION (GREEN BOOK).
- ④ BEDDING MATERIAL SHALL BE USED WHEN THE SAND EQUIVALENT OF THE NATIVE MATERIAL IS LESS THAN 30 AS SPECIFIED IN THE PROJECT PLANS AND SPECIFICATIONS OR AS APPROVED BY THE CITY ENGINEER.
- ⑤ INITIAL BACKFILL MATERIAL SHALL BE OF SELECT MATERIAL AS SPECIFIED IN THE PROJECT PLANS AND SPECIFICATIONS OR AS APPROVED BY THE CITY ENGINEER. INITIAL BACKFILL SHALL BE COMPACTED TO 90% MIN. & TESTED. TEST SHALL BE APPROVED BY THE GEOTECHNICAL ENGINEER AND THE CITY ENGINEER PRIOR TO FINAL BACKFILL.
- ⑥ FINAL BACKFILL SHALL BE SELECT MATERIALS SPECIFIED IN THE PROJECT PLANS AND SPECIFICATIONS OR NATIVE IF DETERMINED BY THE CITY TO BE ACCEPTABLE AND COMPACTED AS NOTED HEREON. COMPACTION TESTS SHALL BE APPROVED BY THE CITY ENGINEER PRIOR TO PLACEMENT OF C.A.B.
- ⑦ CRUSHED AGGREGATE BASE (CAB) SHALL BE IN ACCORDANCE WITH SECTION 200-2.2 OF THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION ("GREENBOOK") AND SHALL BE COMPACTED & TESTS APPROVED PRIOR TO PLACEMENT OF A.C.
- ⑧ ASPHALT CONCRETE (AC) SHALL BE REPLACED IN KIND (B-PG 70-10 OR B-AHRM-GG-PG 64-16) AND IN ACCORDANCE WITH SECTION 203-06 AND 201-11 OF THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION ("GREENBOOK") OR AS APPROVED BY THE ENGINEER.
- ⑨ COMPACTION TESTS SHALL BE TAKEN EVERY 300', MINIMUM OF 1 PER LOCATION.
- ⑩ TRENCHES WHICH ARE 30" IN DEPTH OR LESS AND 18" IN WIDTH OR LESS SHALL BE BACKFILLED WITH ONE-SACK CEMENT SLURRY.
- ⑪ IN THE EVENT WALL FAILURE, TRENCH LIMITS MAY BE EXTENDED AS DETERMINED BY THE CITY ENGINEER. ADDITIONAL BACKFILL REQUIREMENTS MAY BE REQUIRED. 1' AC/CAB "WING" SHALL BE LOCATED FROM FARTHEST LIMIT OF TRENCH OR TRENCH WALL FAILURE AS DETERMINED BY THE CITY ENGINEER.
- ⑫ FULL AC REPLACEMENT OF THE ASPHALT BETWEEN THE TRENCH AND THE CURB OR GUTTER SHALL BE REQUIRED FOR ANY TRENCH WHERE THE PAVEMENT REMOVAL IS WITHIN 3' OF CURB OR GUTTER.
- ⑬ REMOVAL OF 6 OR MORE SEPARATE AREAS OF PAVEMENT WITHIN A 150' LONGITUDINAL LENGTH OF STREET SHALL REQUIRE A TYPE II SLURRY SEAL EXTENDED 5' BEYOND THE LIMITS OF THE OUTERMOST PAVEMENT REMOVAL.
- ⑭ THERE IS A 3 YEAR MORATORIUM ON NEWLY PAVED STREETS. ANY TRENCHING WITHIN THIS PERIOD REQUIRES APPROVAL FROM THE CITY ENGINEER.

Note: *The above Trench Detail Notes are the CITY's standard and can be found on Standard Drawing 1306*

Install two (2) 2" HDPE and two (2) 7-way (16mm) MicroDuct in accordance with CITY Fiber Optic Design Guidelines. Trenching shall be per CITY Std. 1306.

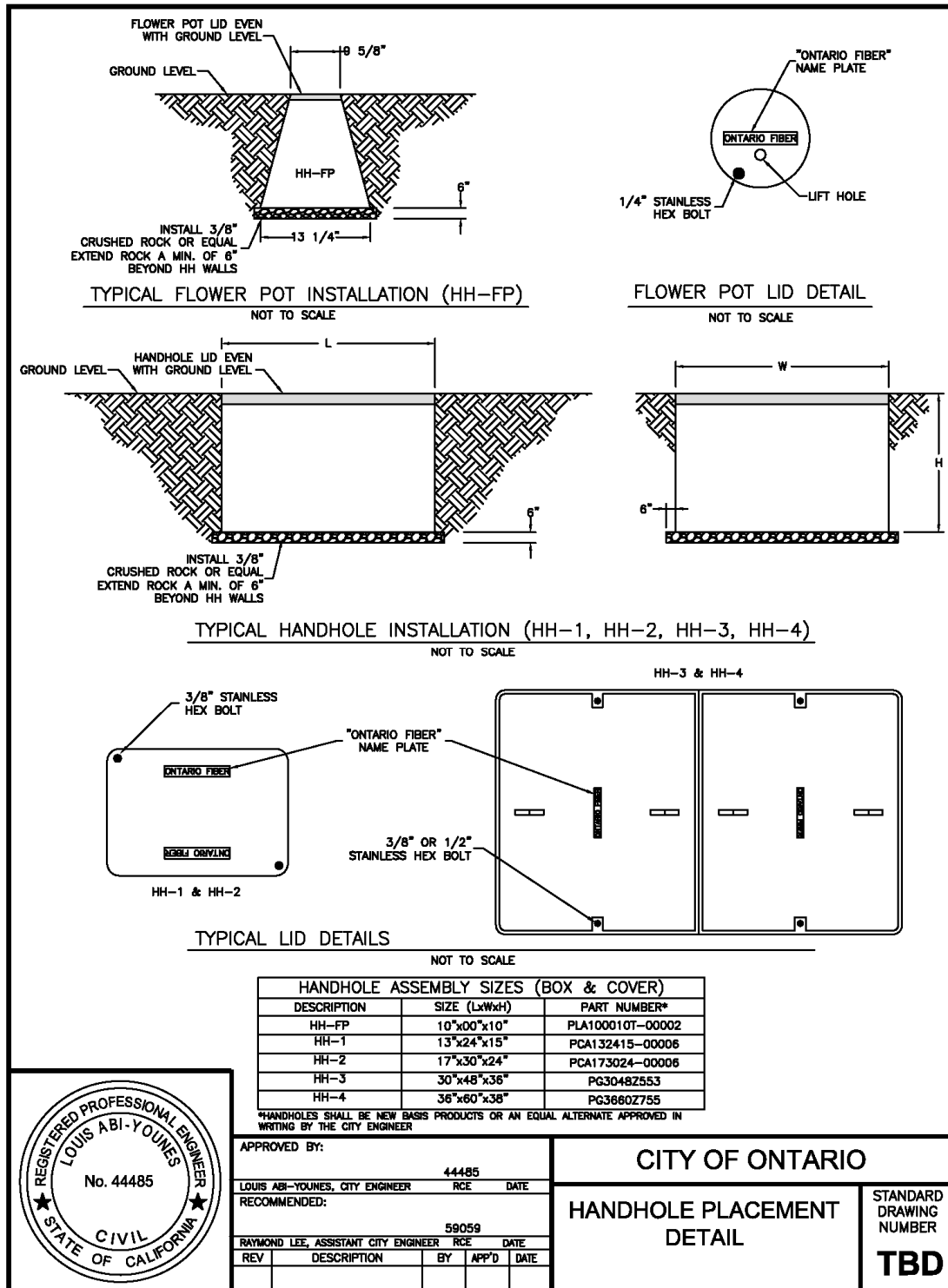
Design Guideline Figure 2 – Primary Ring Plus (+) 2” Duct (PR+2’')





Updated Development Guidelines

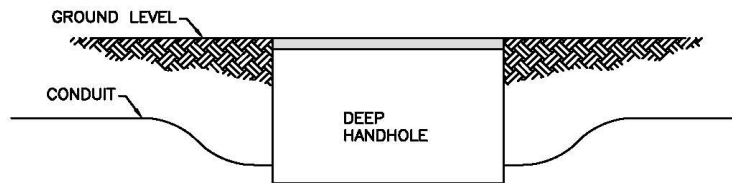
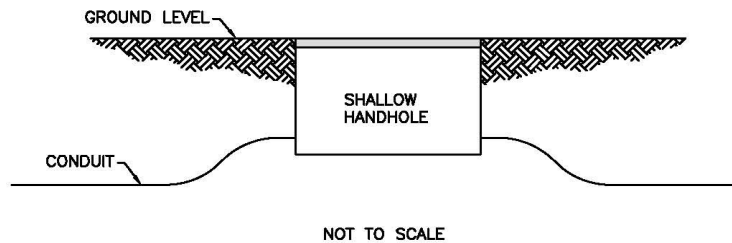
Figure 24 – Recommended Standard Drawing





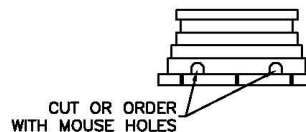
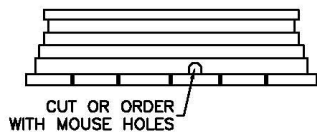
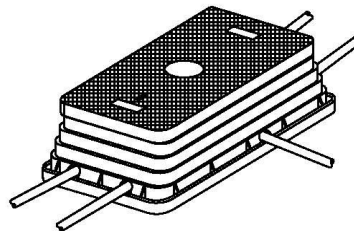
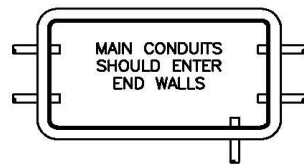
Handhole Conduit Entry Detail

Design Guideline Figure 3 - Handhole Conduit Entry Detail



TYPICAL CONDUIT HANDHOLE ENTRY

CONDUIT THAT SWEEPS INTO THE HANDHOLE MUST ENTER THE HANDHOLE FLUSH AND LEVEL TO AVOID FIBER MICRO BENDING. WHEN ENTERING A SHALLOW BOX, THE CHANGE IN THE ELEVATION OF THE CONDUIT RUN SHOULD BE KEPT AS SHORT AS POSSIBLE IN ORDER TO MAINTAIN MAXIMUM DEPTH.



RECOMMENDED DUCT/DUCTS ENTRY POINTS



Conduit Sweep Details (Joint Trench Installation)

Design Guideline Figure 7 - Conduit Sweep Details (Joint Trench Installation)

