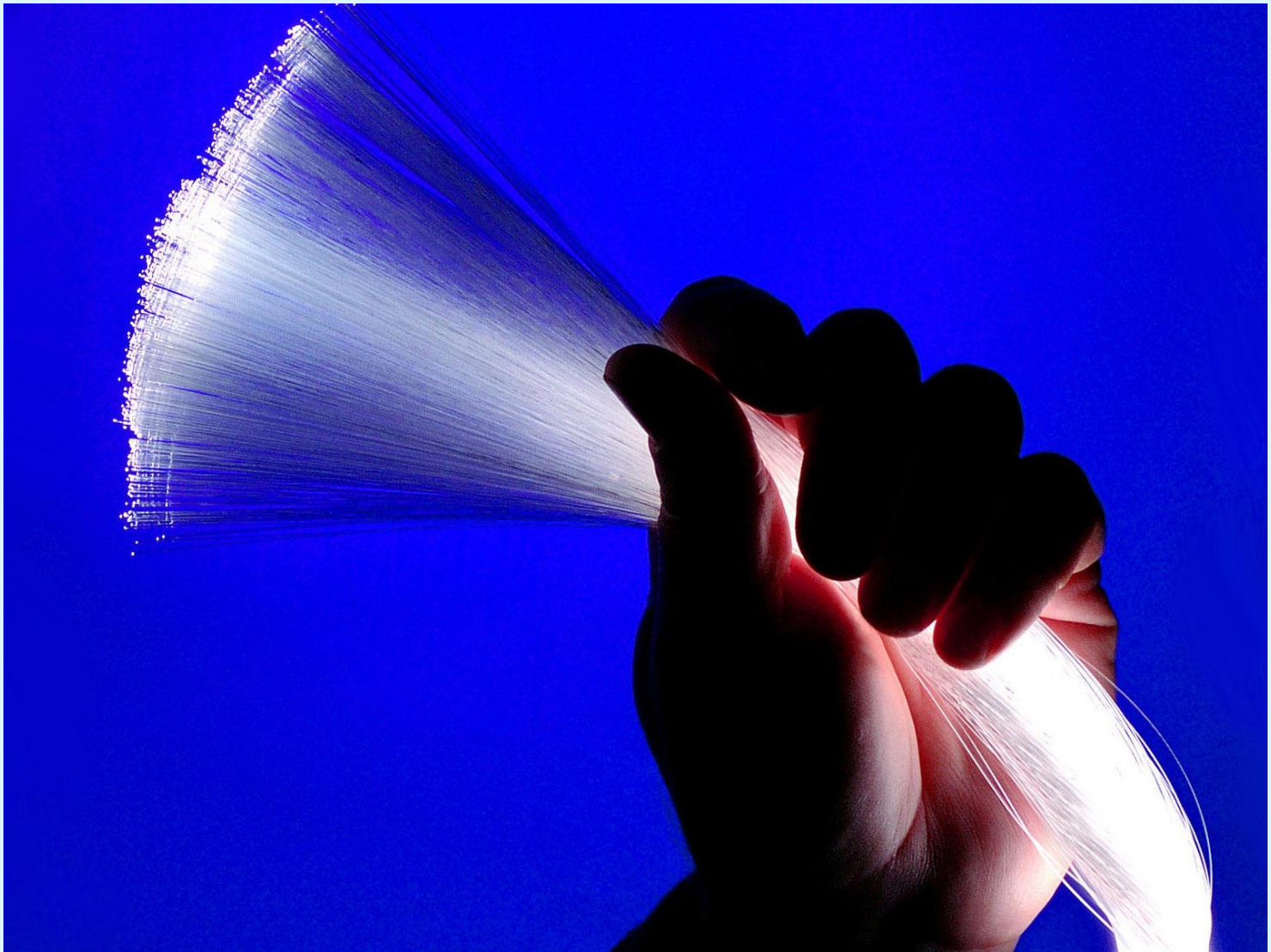
City of Milwaukee
Department of Public Works
March, 2011

Communication & Conduit Programs



DPW Communications

- Design, install, operate, maintain City Wide Area Network
- Copper, fiber cables
- Call boxes
- Phone system
- Network hardware

Capital Program Funding Elements

- Copper cable – small projects for remote facility connections
- Fiber optic cable –
  1) extend network: Housing Authority, libraries, remaining City buildings
  2) network redundancies: critical facilities
- Phone hardware – upgrade, maintain phone system
- Network hardware – upgrade, maintain core networks

Copper Cable - Background

- Communication circuits: phone system, network connections, SCADA and other systems
- Used since 1870
- Approximately 1,500 miles
- Most conduit underground-limited aerial, direct-buried

Cable Installation

Copper Cable Maintenance

- Widely deployed; variable age, condition
- Maintained, repaired as needed for active circuits
- Limited capital funds new installations
- Migrating to fiber optic technologies

Call Boxes

- About 1,200 in service
- Used by police, crossing guards
- Distribution points for copper infrastructure
- No new installations
- 50 removed/repaired annually due to construction, knockdowns

Fiber Optic Cable - Background

- City of Milwaukee Optical Network (COMON) - fiber optic cables in 560 miles of underground conduit
- Circuits - data, telephony, SCADA, security, building management, fuel management, telemetry, video systems
- Serves other public entities - UWM, MATC, Marquette, Discovery World, Milwaukee World Festival, Midwest Airlines Convention Center, VISIT Milwaukee, MIAD, Milwaukee Public Museum, Alverno

Fiber Optic Cable - Splicing

Fiber Optic Cable - Development

- Approach –
  1) extend network: Housing Authority, libraries, remaining City buildings
  2) network redundancies: critical facilities
- 300 miles installed, additional 5 miles per year
- Prioritized by construction schedule
- Migration from copper to fiber

Phone System - Background

- Interconnects City-owned facilities
- Approximately 5,200 extensions
- Multiple locations: fail-over, redundancy
- MPD separate phone switch

Phone System – Upgraded in 2005

Before

After

Phone System - Maintenance

- Costs for maintenance, changes charged to departments
- Upgrades five-year intervals
- Support for current software, hardware limited
- System upgrade 2012

Data Network - Background

- Network access 100 locations
- 11,000 network ports
- Multiple data centers: redundancy, failover
- Consolidation of services to IP

Data Network - Maintenance

- Hardware upgrade goal five-year interval
- Core hardware upgrade 2008
- Software upgrade 2011
- Core hardware upgrade in 2015

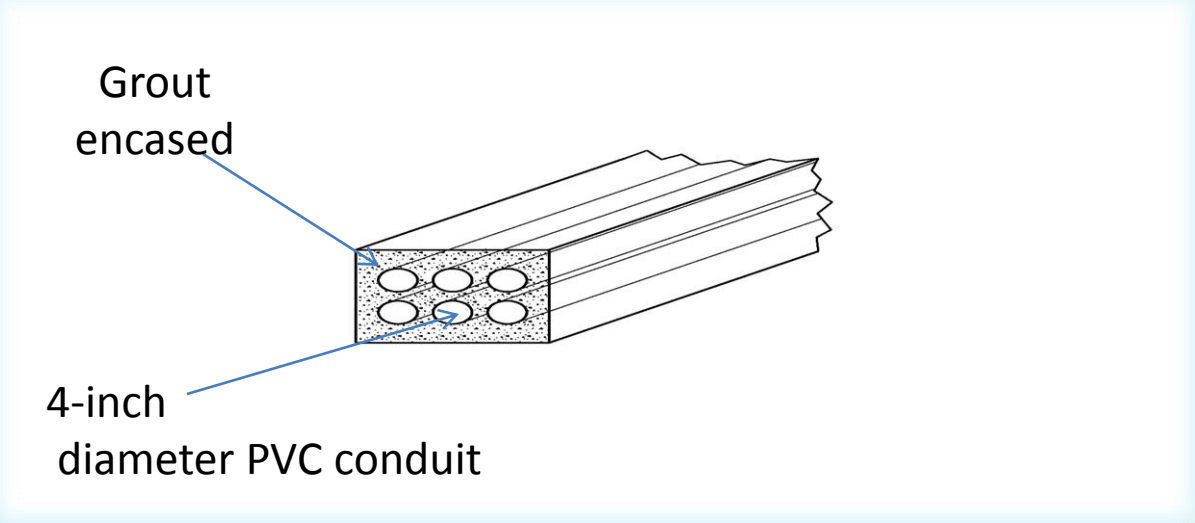
Communications Conduit and Manholes

Purpose:

Conduit protects and provides a path for communications, traffic and street lighting cables

Manholes provide access points to maintain and pull fiber and copper cables

Typical Conduit Package Cross-Section



560 miles of conduit, measured end-to-end

9% Iron pile (1888—1905)

19% Clay tile (1905-1930)

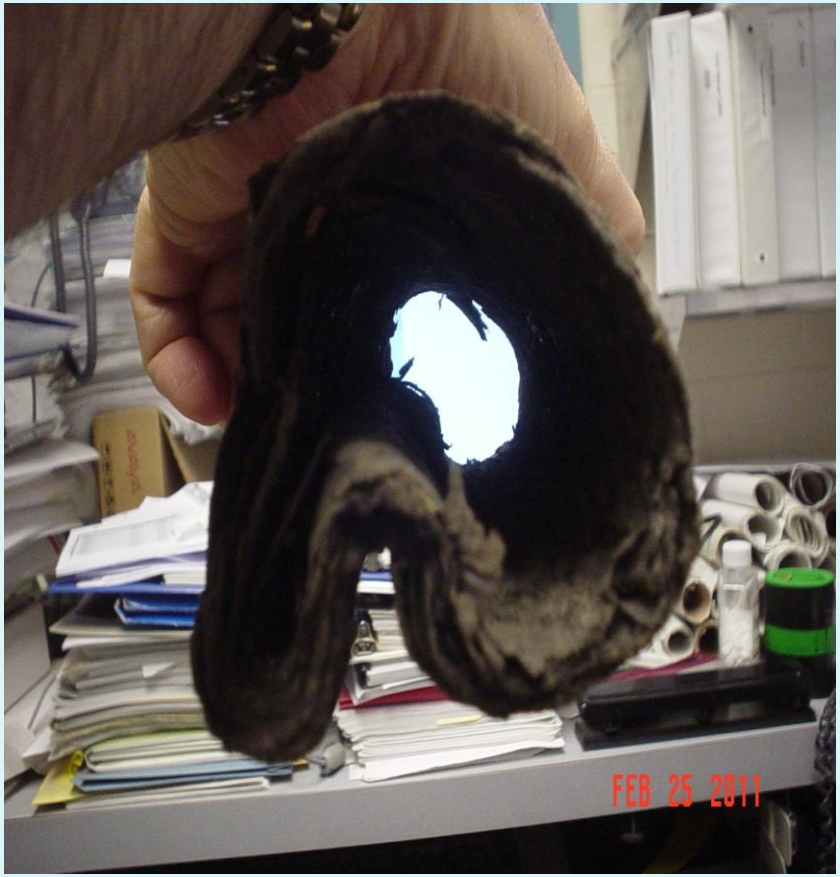
56% Fiber (1930–1980)

16% PVC (1980- Present)

Ducts

PVC Pipe in Clay Duct

Fiber Duct



New Conduit with Pull Ropes

Manhole Information

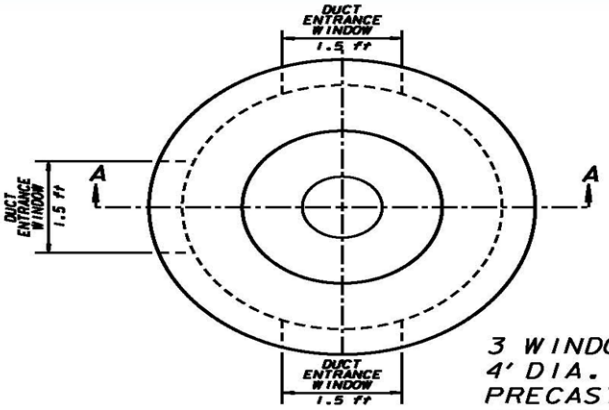
7,529 Active Manholes

43% Brick Manholes (1888 – 1950)

40% Block Manholes (1950 – 1980)*

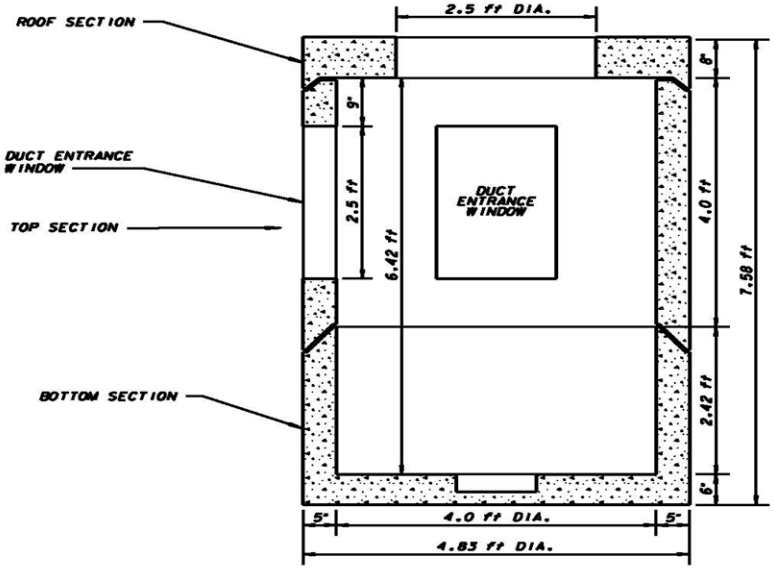
17% Precast Concrete Manholes (1980 – Present)

* Block manholes fail at a faster rate; no reinforcement used during installation



3 WINDOW OPENING
4' DIA. X 6'-5" HEADROOM
PRECAST CONCRETE MANHOLE
CONSTRUCTED IN 3 PARTS
ROOF, TOP & BOTTOM

TOP VIEW



SECTION VIEW "A-A"

N.T.S.

Block Manhole Repair

Manhole Condition Reports

- Currently manholes are not inspected on a regular schedule
- Inspection record data base created in 1988
- Over 50% of manhole inspection reports are 20 years old
- 400 Need to be repaired typically $1,000 – $5,000
- 200 Need to be replaced typically $10,000 - $15,000
- Manhole repair/replacement is done while fiber and cable are kept active
- 2009, private contract was let to replace 20 manholes $262,299

Manhole Rehab Program

7529 Manhole → **100 MHS annually**
75 yrs

80% repair	80 @ $3,000 = $240,000
20% replace	20 @ $12,500 = $250,000
	100 $490,000

Work to do based upon manhole condition reports:

Repair 400 manholes @ $3,000* =	$1,200,000
Replace 200 manholes @ $12,500* =	$2,500,000
	$3,700,000

*average cost

Budget History

	New Conduit *	Manhole Rehab(repair/replace)
2011	800,000	200,000
2010	1,000,000	200,000
2009	400,000	200,000
2008	400,000	200,000
2007	400,000	200,000
2006	347,827	200,000

**New conduit and manhole work is coordinated with paving projects when ever possible to reduce pavement restoration costs.*