COILED DUCT

Delivering Durable Future Proof Ducting

What is COD?

C.O.D. stands for Corrugated Optic Duct, the registered brand of our product, with built-in multiple cable ducts inside of outer duct as an integrated single body. Optiroad COD has very distinctive differences from the conventional telecommunication PVC ducting System.

Optiroad C.O.D. opens new era of telecommunication backbone with its built-in multiple inner ducts (3 to 5) inside of the outer duct by means of assembling cable ducts in the course of production. Both inner and outer ducts are made of HDPE (High Density Polyethylene) having high flexibility enabling rolled-on spool regardless of numbers of inner ducts built-in.

Coiling Length of C.O.D. is unlimited, however depending on the numbers of inner ducts and diameters thereof; each reel may practically coiled up to 500 meters, however, coiling even 1,000 meters of small dimension model is also available.

Owing to such a flexible and lengthy product of COD, it enables quick installation reducing considerable consecutive work quantities such as trench excavation, inner duct insertion (no need as it is readily built-in), inner duct related works (such as cleaning of duct line upon completion of outer duct connection and inspection thereof) and installation time.

Owing to such benefits, great savings of project cost as well as traffic trouble are anticipated contributing to the construction of telecommunication infrastructure.

Demand for the underground installations of power cable and telecommunication cable are increasing tendency to secure safety and space as well as beautification in rural, industrial and residential area according to the modern industrial and municipality congestion.

The conventional underground cable being applied have been Hume pipe, Steel pipe And PVC pipe, that are straight, heavy and being caused lots of disadvantages in work sites, as such materials required numerous connections couplings due to short length of ducts (Max. 6 meter/PVC). In addition, it has been causing increase of project cost and troubles due to long period of installation time. COD has successfully solved all such difficulties and disadvantages.
COD is product of specific spiral formed, which solved the vulnerability of compressive load of conventional straight PE pipe to be several times stronger than that of conventional pipes, increasing the efficiency and flexibility. COD promises to meet the requirement of end users with its considerable profitability, endurance and economy.

Benefits of COD

1. Better Flexibility

Owing to spiral forming of product, COD is easy to bend without special bending efforts, and easy to by-pass or over pass hurdles along with the duct line.

2. Lengthy pipe

Owing to lengthy and coiled on drum, it reduces considerable labour cost as well as working period to install by waving numerous connections in between two manholes but one time installation.

On top of it, COD never require inserting of inner duct into outer duct owing to built-in production of multiple inner ducts.

3. Lighter in weight

Owing to the lighter gravity (0.95:1.43), COD is considerably lighter, which offers benefit in handling in the work site and transportation compare to the conventional duct.

4. Stronger

Owing to the readily built-in multiples numbers of inner ducts perfectly without any loose space inside of spiral outer duct, COD offers considerable advantage in terms of compressive load.

5. Safety

COD stands safe in Earthquake and Land Subsidence owing to its strong compressive load and flexibility.

6. Better resistance against chemicals and better endurance:
COD lasts semi-permanently owing to resistance against chemicals and corrosion
free from salt water or wetland.

7. Easy insertion of copper & optic fibre cables
COD facilitate easy insertion of cables up to
the maximum-coiled length owing to perfect alignment of inner ducts and less friction,
as it has no connections. In addition,
it enables to extend the manhole distance.

On top of it, COD enables to insert cable up to 75% of inner diameter of inner duct, while conventional duct allows only 50% of it.

8. High Reliability
COD is non-conductive of electricity,
and therefore, it is ideal to apply for
power cable duct.

9. Cost Efficiency In consideration of all advantages and efficiency, COD offers cost efficiency throughout all consecutive work stages and endurance.

Specific Benefits COD Offers

a. Quick and economic installation by saving labour and materials. COD laying in-between two manholes may be done by single laying operation regardless of built-in multiple numbers of inner ducts and length in-between two manholes.

b. Saving working period considerably.

c. Saving Fibre Optic Cable owing to perfect alignment of inner duct straight, while insertion of inner duct through installed PVC ducting system may cause twist consuming more length of Fibre Optic Cable.

d. Ø111mm of COD is readily built-in of 5 inner ducts of Ø28mm, while the conventional PVC ducting system is limited to only three (3) inner ducts in the equivalent diameters: potentially saves cost greatly (approx. 170% of capacity efficiency).

e. Reducing excavation quantities, as the required trench width is being required much less than that of the conventional method (less than 60% of conventional system).

f. Less traffic troubles at job site and its adjacent area in appreciation of:

   1) Considerably less working period in comparison to the conventional method.

   2) Not many materials required to be mobilized and stored at job site, but transported in reels keeping job site clean and neat.

   3) Less transportation requirement for the disposal of removed materials owing to the reduced excavation quantities; and

   4) Less transportation requirement for sand transportation to job site for padding at the excavated trench bed and above the laid duct.

   5) No inner ducts mobilization after installation of Outer Duct is required.

g. Normal operation allows single laying up to 500 meters, while special operation with special design of COD trailer allows as much as over 1,600 meters in single laying operation. Which saves both coupling or connection materials and labour greatly.

h. Moving of COD roll in the job site and easy installation thereof by means of releasing COD from reel are with least manpower owing to the benefit of light-weight and smooth releasing.

i. The maximum diameter of Fibre Optic Cable to insert into the inner duct is as much as 80% of Inner Duct diameter while conventional PVC can only house up to 50% at maximum (efficiency: 160%).

j. No need to construct additional manholes at the curving points, while the conventional products need either such constructions or special bending.

k. Pre-lubrication or Silicon coating: COD does not necessarily need neither pre-lubrication nor Silicon coating inside of inner duct to facilitate easy insertion of cables owning to perfect alignment of inner ducts.

However, should clients require such Silicon Coating, we are ready to manufacture and supply our product as requested by any client.

l. Models: Various models of COD are available depending on requirements for numbers and diameters of inner-ducts. Customer designed combination of inner ducts as well as dimension is acceptable.

m. Colour scheme of inner-ducts: Customer-designed colours are acceptable. The available Colours of ready-made products are blue, green, yellow, white, scarlet, purple and black.

n. Insertion of Cable into the installed duct: Air Jetting method (Super Jet) will insert the cables into the installed ducts regardless of the intervals of manholes.

o. Thermal expansion & contraction: Thermal expansion and contraction of outer ducts are comparatively lower than that of conventional ducting system, and stay at the same rate owing to the equivalent raw materials of both inner and outer ducts.

p. COD maintains good flexibility allowing arc bending manually up to 90 degree or more at the even angle, and does not require any particular tools for bending or straightening.

Benefits of COD by Working Stages

Through the process of installation work stages, COD offers various advantages from the preparation stage to finishing and maintenance stages after completion as follows.

1. **Preparation Stage:**
    a. Application of COD reduces volume of excavation by reducing width of trench, as no individual piece-by-piece duct connection works in the trench are required. In addition, it reduces working space at job site as well as transportation.
    b. Application of COD reduces damaging risk of existing underground infrastructures by reducing trench dimensions.
    c. Application of COD reduces disposal of excavated soil owing to less excavation.
    d. No fine levelling work of trench bed is necessarily required but rough levelling.
    e. No sand padding on trench bed is necessarily required owing to high flexibility and Compressive Load (292kgs/㎠).
2. **Installation Stage: Application of COD offers the following advantages.**
    a. No piece-by-piece individual connection works in the trench are required, coupling works may be done on the ground if required.
    b. Great saving of construction period.
    c. Great saving of traffic troubles.
    d. Absolutely no inner duct insertion process is required.
    e. Keeps job site clean from bundles of mobilized materials.
    f. No dual mobilizations of materials are required.
3. **Finishing Stage: Application of COD offers the following advantages.**
    a. No risk of damaging the installed duct by compaction or heavy traffic above the trench after completion owing to good Compressive Load of COD.
    b. Quick removal of temporary site facilities or mobilized materials from job site (COD reel may be released as mounted on trailer or truck).
4. **Maintenance Stage: Application of COD offers the following advantages. The following features of COD enables to save maintenance cost upon completion of installation.**
    a. Free from water or humidity infiltration.
    b. Better fire resistance compare to the conventional PVC duct system.
    c. Better Compressive Load (approx. 3 times of PVC).

d. Easy insertion & replacement of cables owing to absolutely no twisting risk but perfect alignment of the inner ducts owing to welded & built-in single body.

Test Report Preface

PVC Outer Duct under Sedan Wheel

COD under Wheel of 5 ton cargo truck

1. Compressive Load:	< 292Kgf/CM2
2. Heat Resistance:	-0.4% (at < 110℃)
3. Thermal Deformation Factor:	> 3%
4. Tensile Strength:	321Kgf/CM2 (at 5% deformation of outside diameter).
5. Friction Factor:	> 30%
6. Heat Transforming Factor:	> 3% at being stored 60 minutes at 110℃
7. Impact Test:	Passed (Free from distortion, twist and tear.)
8. Bending Performance:	Bendable up to > -20℃ temperature
9. Chemical Resistance(Appearance):	from Liquid form of Chemicals No defects from: 40% of HNO3 No defects from: 40% of NaOH No defects from: 30% of H2SO4 No defects from: 10% of NaCl
10. Voltage Resistance:	AC2,000V (< 15 minutes)
11. Insulating Resistance:	< 200M Ohm
12. Air Sealing:	Perfect (Coupler)
13. Water Sealing:	Perfect (Coupler)

SCANDENT GROUP
Electrical & Data Supply

Advantages of COD versus PVC Conduit

Item to compare		COD	PVC	Remarks
1	Installation in 1 time	1 installation between 2 manholes	To connect numerous 6 meter long ducts	
2	Installation duration	Not more than 2 hours for 1,000 meters after excavation	Need tremendous hours to connect 6 meter long individual duct	
3	Coupler	No need	Need in every 6 meters	
4	Coupling accessories & consumables	No need	Need in every 6 meters	
5	Trench Depth	Min. 30 Cm	120 Cm	
6	Trench Width	30Cm~50Cm Vertical	Approx. 150Cm Slope	Open cut
7	Cleaning of Installed Duct	No need	Need cleaning & Need inspection upon completion of coupling	
8	Inspection of Air Tightness	No need	Need inspection upon completion of coupling	
9	Sand bedding & Padding	Very limited	Need to protect duct	
10	Trench Refill	To use excavated soil	Need borrowed soil	
11	Disposal of excavated soil	Not much	All	
12	Mobilization of material	1 mobilization only	1 mobilization for ducting 1 mobilization for inner duct insertion	Possibly additional 1 more for cleaning & inspection
13	Insertion of Inner Duct	Absolutely no need	To insert after completion of Ducting	
14	Numbers of inner duct insertion	100% of inner dimension of Duct (as built product)	60~65% of inner Dimension of Duct	
15	Alignment of inner duct Insertion of cable	Perfect Up to 80% of Inner diameter	Twist or loose Approx. 50% of inner diameter	
16	Curving of Duct Line	Self-curving	Need special bending or need extra manhole	
17	Traffic trouble	Light	Very heavy	

※ **Foot Note**

1. Duct material of COD may cost higher than that of PVC, however, the consecutive works will be tremendously reduced.
2. Efficiency of COD ducting as shown in item 14 & 15 is considerably higher than PVC.

3. Because of quick installation of COD, installation after midnight without disturbing traffic trouble is one of considerable benefits.

General Comparison Table of COD to Conventional Duct

Category	Conventional P.V.C. Duct	C.O.D. (Corrugated Optic Duct)
Material & Strength	- PVC: vulnerable to impaction damage - Disconnection: Possibility of dis-connection of connected points of outer duct due to ground compressive load. - Thermal expansion & contraction during the installation period and in service	- Stand good against impaction damage and no damage risk from freezing temperature. - Strong Concavo-convex shape provides good strength and stays same shape against ground compressive load. - Stays stable from thermal expansion & contraction of duct during or after installation
Installation	- Many individual connections: maximum length is 6 meters. - To construct manhole to diverse direction of the line. - Complicated installation work as the insertion of inner ducts is in the second stage after the installation of outer duct. - Causes traffic troubles (jamming) in case of urban installation. - Inner duct may twist in the course of insertion. - Maximum number of inner duct is limited to 3 ducts.	- No duct connections in-between two manholes up to 500 meters or more. - Single installation process: No need to go through complicated inner duct insertion process owing to readily built-in both outer and inner ducts. - To by-pass minor hurdles and skips un-necessary construction of manhole to diverse direction of line within the radiation of curbing angle. - Increase of duct efficiency by increase of numbers of inner ducts to be inserted up to 5 ducts at approx. same price. - Light weight allows easy handling and transportation.
Economy	- High construction cost.	- Economic construction cost and time saving

SCANDENT GROUP
Electrical & Data Supply

General Comparison of COD with Conventional Ducting System

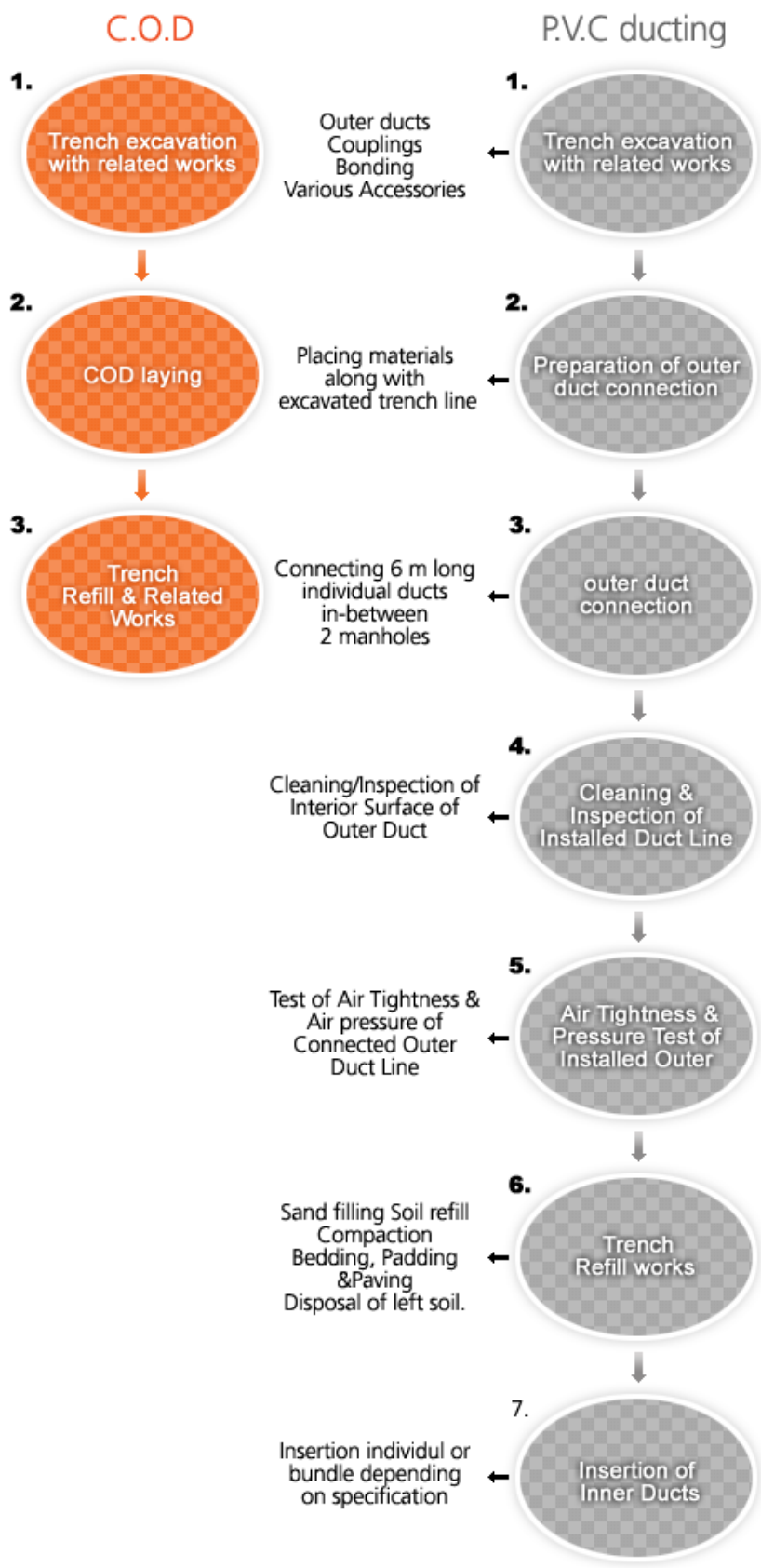
Description of comparison	C.O.D.		Conventional Method	
	Outer Duct	Inner ducts	Outer Duct	Inner ducts
Raw material	H.D.P.E	H.D.P.E	P.V.C.	H.D.P.E
Length	No limit	No limit	6 meters (At maximum)	No limit
	(Up to 500m or 1,000m)			
Connection	No need (saves materials and accessories)		In every 6 m	
Insertion of inner ducts	No need		To insert	
Intermediate Manhole	No need to build		To build in turning point	
Horizontal alignment of inner duct	Straight	Straight	Straight	twisted
	Saves optic cable about 3 to 5%			
Trench Dimension (Volume) (28mm inner ducts in 112mm outer duct) (Dimension)	(No need man-working space: vertical cut) Up to 5 inner ducts 0.3m(W) x 0.6m(H)		(Slope cut to secure man-working space) 3 inner ducts only 0.5m(W) x 0.81m(H)	
Trench Bedding	Rough bedding (passes over/by hurdles)		Fine bedding	

SCANDENT GROUP
Electrical & Data Supply

Physical Characteristics

Physical Testing Items	Unit	HDPE	PVC	Remarks (HDPE)
Gravity	g/㎤	0.95	1.43	Lighter
Tensile Strength	Kg/㎠	260~260	350~600	More strength
Tensile Modulus	Kg/㎠	10,000~12,000	25,000~35,000	Less Modulus
Curvature Strength	Kg/㎠	350	860~1,000	Easier bending
Curvature Modulus	Kg/㎠	8,500	23,000	Easier bending
Impact Strength	Kg.Cm/㎠	< 13.8	5~6	More strong
Hardness	Shore-D	64	70~90	Less hard
Specific Heat	Kg.Cm/㎠	0.55	0.24	More resistance
Softening Point	℃	121	80~90	More endurance
Limit of usage temperature	℃	From -60~60	From -5~60	Much less limit
Withstand Voltage	Kv/mm, 1 minute	48	28~32	More resistance

Work Flow


C.O.D
P.V.C ducting
1.
Trench excavation with related works
Outer ducts
Couplings
Bonding
Various Accessories
1.
Trench excavation with related works
2.
COD laying
Placing materials along with excavated trench line
2.
Preparation of outer duct connection
3.
Trench Refill & Related Works
Connecting 6 m long individual ducts in-between 2 manholes
3.
outer duct connection
4.
Cleaning/Inspection of Interior Surface of Outer Duct
Cleaning & Inspection of Installed Duct Line
5.
Test of Air Tightness & Air pressure of Connected Outer Duct Line
Air Tightness & Pressure Test of Installed Outer
6.
Sand filling Soil refill
Compaction
Bedding, Padding &Paving
Disposal of left soil.
Trench Refill works
7.
Insertion individul or bundle depending on specification
Insertion of Inner Ducts