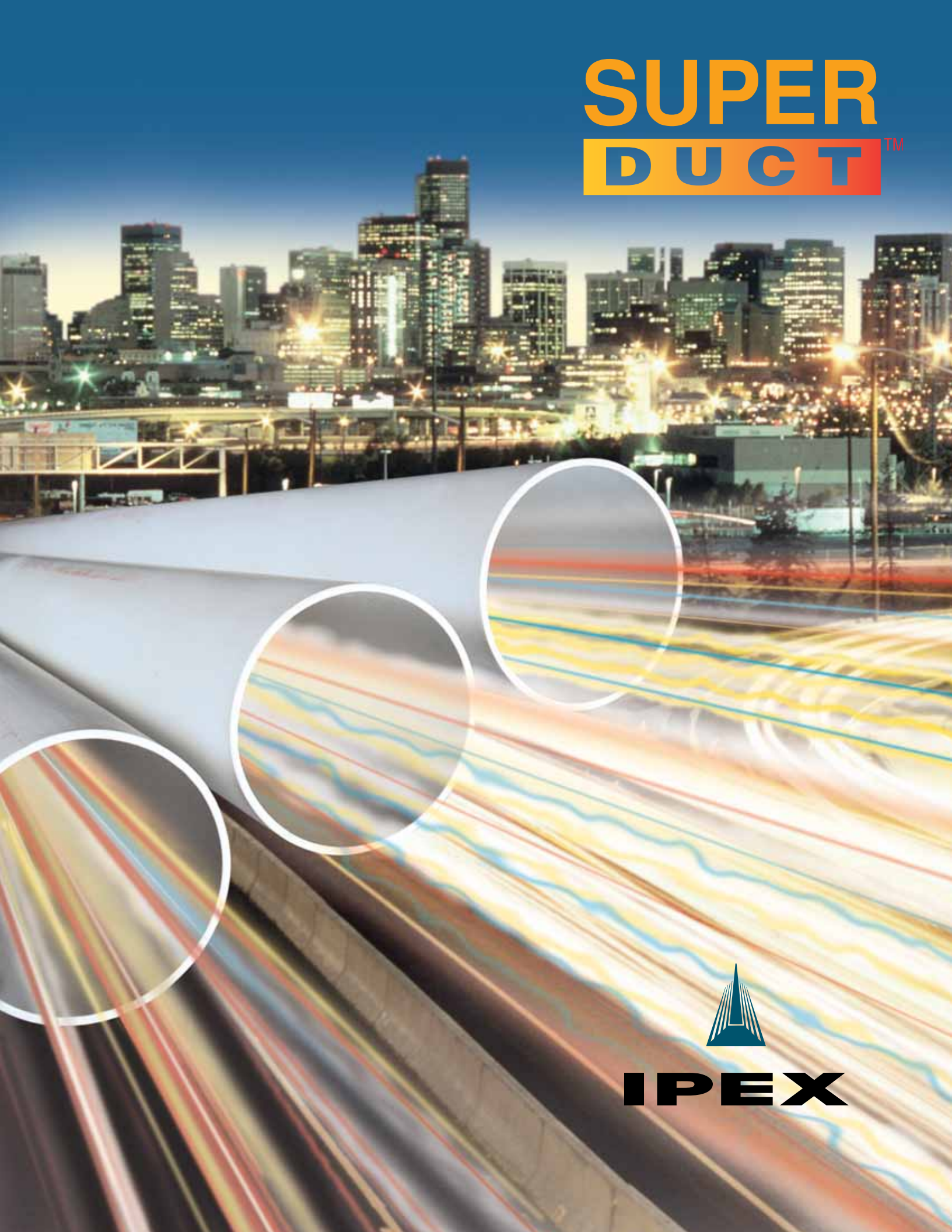

SUPER
DUCT™
IPEX

Super Duct is recognized by major utilities, contractors and engineering firms as the premier ducting product available on the market.

Super Duct is manufactured with a specialized compound, and engineered for high impact and crush strength specifically required by utilities for underground duct. This compound also enhances the friction coefficient of Super Duct.

Super Duct (Type DB-2) is certified to CSA Standard C22.2 No. 211.1 both for encasement in concrete/masonry and for direct burial.

ADVANTAGES

Light Weight

Super Duct is easy to carry and install, reducing labour requirements and costs.

Long Lengths

Super Duct is available in 10' (3m) and 20' (6.1m) lengths, minimizing the number of connections needed.

Bell Ends

Super Duct is bell-ended, allowing for easy assembly in the field.

High Compressive Strength

Super Duct's specially formulated compound is designed to withstand high loads.

Low Coefficient of Friction

The smooth bore of Super Duct facilitates cable pulling and eliminates costly cable damage.

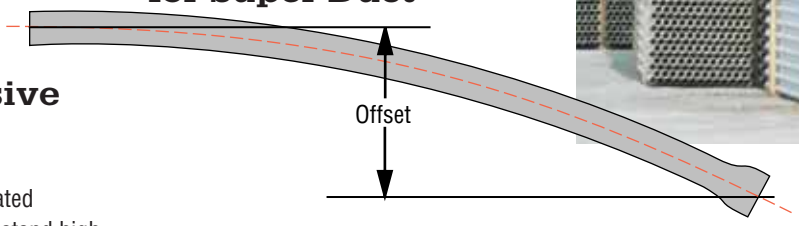
Quality Control

Stringent, continuous testing ensures that Super Duct is a consistently high quality product.

Field Bending

The natural flexibility of IPEX Super Duct allows field bending, so that minor changes in elevation or direction can often be accommodated without the use of special sweeps or fittings. The following table indicates typical maximum offset bends that can be achieved by "cold bending."

Allowable Offset for Super Duct



Size		Maximum Allowable Offset for 10' Length of Super Duct		Maximum Allowable Offset for 20' Length of Super Duct	
in.	mm	in.	mm	in.	mm
2	50	20	508	79	2,007
3	75	14	356	56	1,422
3 1/2	90	12	305	49	1,245
4	100	11	279	43	1,092
5	125	7	178	35	889
6	150	7	178	29	737

NOTES: 1. Axial deflection should not be attempted at the joints.
2. The above values were established for ambient temperatures above the freezing point. Increased radii may be desirable at below-freezing temperatures.

DIRECT BURIAL

Trench Bottom

The trench bottom should provide continuous, firm and uniform support for the duct bank construction. Care should be taken to avoid lumps, ridges, depressions and stones causing “point” contacts or uneven bearing.

Rock or Shale

Excavate 3" (75mm) below desired depth and bring back to grade with selected tamped soil. This will provide duct with a uniform bedding surface.

Unstable Soils

Tests should be conducted to establish soil strength in marshy or swampy areas. It may be necessary in these conditions to dig deeper and refill with crushed stone or gravel, or to employ mats, timbers or a concrete base.

Placement of Duct

After the first tier of ducts is installed, backfill and compact as outlined below. If wood combs are employed for spacing, remove them as backfill is placed and tamped. Then begin next tier.

Initial Backfilling

Be sure backfill material contains no stones larger than 3/8" (10mm). Firmly tamp backfill around ducts to provide maximum supporting strength.

1. Fill side and centre to duct tops. Use hand tamper only to tamp firmly.
2. Backfill over duct to required thickness (see note) and tamp firmly, using only a hand tamper.

Final Backfilling

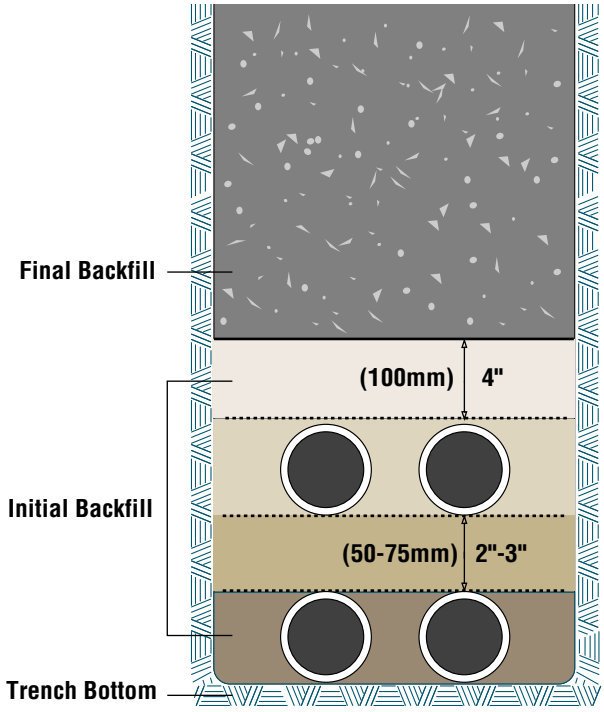
When last tier is placed, hand-place backfill to 4" (100mm) over duct with soil that does not contain stones larger than 3/8" (10mm). Hand-tamping of this layer is optional, depending on specifications.

From this point, backfill may be completed by hand or by pneumatic tamping in layers from 4" to 12" (100mm to 300mm) depending on degree of compaction desired.

When placing backfill by machine, avoid the use of large rocks until a protective layer (minimum 12" or 300mm) is established.

% Deflection of Super Duct in Direct Burial Subjected to H20 Loads

Embedment Material	Density	Super Duct Diameter (in.)	Cover in Feet 2	4	6	8	10
CRUSHED STONE (CLASS I)	90% E' = 3,000 psi	2	0.4	0.3	0.3	0.4	0.4
		3	0.4	0.3	0.3	0.4	0.4
		3	0.4	0.3	0.3	0.4	0.4
		4	0.4	0.3	0.3	0.4	0.4
		5	0.4	0.3	0.3	0.4	0.4
		6	0.4	0.3	0.3	0.4	0.4
CRUSHED STONE WITH FINES (CLASS II)	90% E' = 2,000 psi	2	0.5	0.4	0.5	0.5	0.6
		3	0.6	0.5	0.5	0.6	0.6
		3.5	0.6	0.5	0.5	0.6	0.6
		4	0.6	0.5	0.5	0.6	0.6
		5	0.6	0.5	0.5	0.6	0.6
		6	0.6	0.5	0.5	0.6	0.6
SAND & GRAVELS	80% E' = 1,000 psi	2	0.9	0.8	0.8	1.0	1.1
		3	1.1	0.9	0.9	1.1	1.2
		3.5	1.1	0.9	0.9	1.1	1.2
		4	1.1	0.9	0.9	1.1	1.2
		5	1.1	0.9	0.9	1.1	1.2
		6	1.1	0.9	0.9	1.1	1.2
SAND & GRAVEL WITH FINES (CLASS III)	90% E' = 1,000 psi	2	0.9	0.8	0.8	1.0	1.1
		3	1.1	0.9	0.9	1.1	1.2
		3.5	1.1	0.9	0.9	1.1	1.2
		4	1.1	0.9	0.9	1.1	1.2
		5	1.1	0.9	0.9	1.1	1.2
		6	1.1	0.9	0.9	1.1	1.2
	85% E' = 500 psi	2	1.6	1.3	1.4	1.6	1.8
		3	1.9	1.6	1.7	1.9	2.2
		3.5	1.9	1.6	1.7	1.9	2.2
		4	1.9	1.6	1.7	2.0	2.2
		5	1.9	1.6	1.7	2.0	2.2
		6	1.9	1.6	1.7	2.0	2.2
SILT & CLAY (CLASS IV)	85% E' = 400 psi	2	1.8	1.5	1.6	1.9	2.1
		3	2.2	1.9	2.0	2.3	2.6
		3.5	2.3	1.9	2.0	2.3	2.6
		4	2.3	2.0	2.1	2.4	2.7
		5	2.3	2.1	2.0	2.3	2.7
		6	2.3	2.1	2.0	2.4	2.7



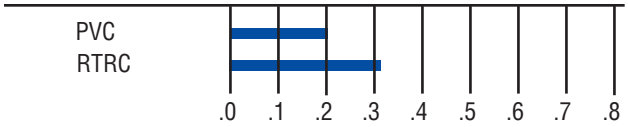
Important: In direct burial, no spacer should be used with Type 2; spacers provide “point” support instead of the continuous bed required. Backfill thickness between ducts is usually 2" to 3" (50mm to 75mm).

Super Duct (Type DB-2)

	Requirements	Reference	
PIPE STIFFNESS @ 5%	43.5 psi (300 kPa)	CSA	C22.2 No. 211.1
CRUSH RESISTANCE	198 lbs. @ 73°F (90 kg @ 23°C) 10% max. residual deflection.	CSA	C22.2 No. 211.1
IMPACT STRENGTH	45 ft. lbf @ 73°F (61J @ 23°C) 25 ft. lbf @ 0°F (34J @ -18°C)	CSA	C22.2 No. 211.1
RESIDUAL STRESS	149°F (65°C) for 4 hours. Allow to cool to 73°F (23°C). 0.5% shrinkage allowed.	CSA	C22.2 No. 211.1
JOINT TIGHTNESS	5 psi (35 kPa) internal water pressure applied for 24 hours.	CSA	C22.2 No. 211.1

Static Friction Coefficient

DUCTING MATERIALS



Solvent Cementing

After cutting IPEX Super Duct, sharp edges or burrs from inside the duct should be removed with a knife. Thoroughly clean the end of the pipe and inside the fitting with IPEX pipe cleaner. Apply a generous amount of solvent cement to both surfaces; slide together and give a quarter turn to ensure solvent is spread evenly on the material. Hold together for a few seconds until the joint is made.

Super Duct Size		No. of Joints
in.	mm	per Litre (.2 gal.)
2	50	80
3	75	60
3 1/2	90	50
4	100	40
5	125	16
6	150	14

Polyethylene Push-Fit Couplings

These couplings make it easy to rapidly assemble cut lengths of concrete-encased Super Duct. Push the spigot end of the duct into the fitting socket and hammer lightly against a piece of wood located at the end of the coupling or pipe until end of duct butts up against the inside shoulder of the fitting. **Push-fit couplings are not watertight and are only recommended for use when encased in concrete.**

Split Duct

IPEX Split Duct is the simple solution to installing duct around existing cables, and repairing existing duct without costly cutting and re-splicing of cables.

Product

Duct shall be IPEX Super Duct or approved equal. Duct, fittings, MONOBLOC spacers and solvent cement shall be provided by the same manufacturer to assure system integrity.

The duct is to be secured mechanically with IPEX MONOBLOC or vertical lock spacers to prevent disturbance to the alignment during installation.

Identification

Duct shall be identified for type and manufacturer and shall be traceable to plant location, date, shift and machine of manufacture. The markings shall be legible and permanent.

Material

Duct for use in underground, encased or direct burial applications shall be made from PVC compound that includes inert modifiers to give high modulus of elasticity, improved weatherability and deflection characteristics.

Standards

Type DB-2 Super Duct and Solvent Cement Fittings as manufactured by IPEX Inc. shall be used for direct burial and/or concrete encased applications. The duct and fittings must be certified to CSA Standard C22.2 No. 211.1 and be installed in accordance with the Canadian Electrical Code Part 1, Rule 12-1150 through 12-1166. Polyethylene push-fit couplings are only to be used in concrete-encased applications.

Dimensions in Inches

Duct Diameter	Minimum ID	Nominal Wall	Average O.D.
2	2.001	.082	2.250
3	3.000	.097	3.250
3 1/2	3.480	.109	3.730
4	3.941	.120	4.216
5	4.974	.153	5.299
6	5.896	.180	6.275

Dimensions in Millimetres

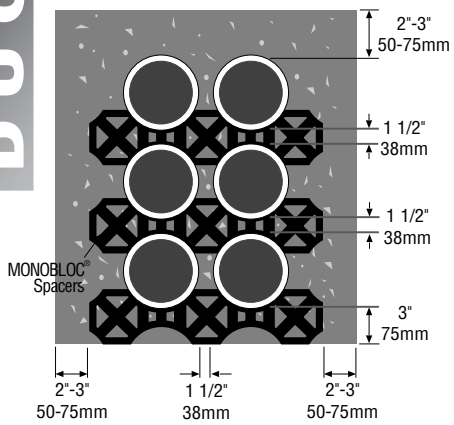
Duct Diameter	Minimum ID	Nominal Wall	Average O.D.
50	50.80	2.08	57.15
75	76.20	2.46	82.55
90	88.40	2.77	94.74
100	100.10	3.05	107.09
125	126.35	3.89	134.55
150	149.75	4.57	159.35

Nominal Weights in lbs./ft.

Diameter (in.)	2	3	3 1/2	4	5	6
Weight (lbs./ft.)	.37	.71	.92	1.15	1.89	2.57

Nominal Weights in kg/m

Diameter (mm)	50	75	90	100	125	150
Weight (kg/m)	.55	1.05	1.37	1.71	2.82	3.83



Built-up or Monolithic method.

CONCRETE ENCASED MONOLITHIC

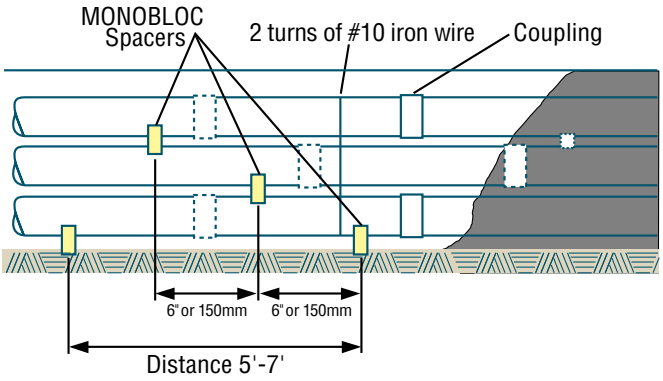
With MONOBLOC spacers in place on trench bottom, lay the first tier of ducts. When using a concrete base, lay bottom tier before base has taken initial set. Place subsequent tiers on spacers on top of the tier until required number of ducts is installed. Then, tie entire assembly together. There is no necessity to weight or brace unless concrete mix is very wet.

The Concrete Pour

Do not allow a heavy mass of concrete to fall directly onto the duct. If this is a possibility, use a plank to direct the concrete down the sides of the bank assembly to the trench bottom. The concrete will flow to the centre of the bank and rise up in the middle, uniformly filling all open spaces. Voids can be eliminated by working a long, flat slicing bar or spatula with care up and down the vertical rows of ducts. Concrete should then flow between and under all ducts.

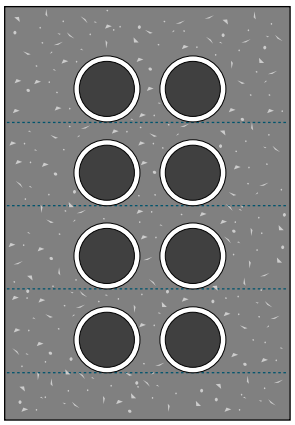
Duct Bank Elevation

Notice that spacers are staggered. It is recommended that spacers should be located approximately one-fifth of duct length from each end. MONOBLOC spacers are available from IPEX.



Backfilling

Backfill with regular excavated soil after concrete has set.



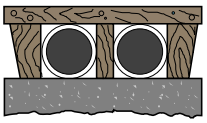
Cross-section of tier-by-tier method.

CONCRETE ENCASED TIER-BY-TIER

The advantage of this method is the production of a solid, void-free concrete envelope.

Trench Bottom

After grading trench, place a foundation of 3" (75mm) concrete on the bottom. It should be smooth and graded.



Type of wood comb used.

Bank Assembly

Lay the bottom tier of ducts on the concrete base. Ducts should be spaced with wooden combs (two per duct length). Concrete the first tier level to top of comb. Remove combs and fill voids. Light tamping will ensure an even surface. Repeat this sequence until back is built up.

Concreting

The concrete will be stronger and denser and the ducts aligned straighter if concrete is allowed to set before assembling next tier. One problem with this method is that the bank will be in a series of layers and therefore more likely to heave and separate under frost conditions. If successive tiers are laid before concrete has set, a satisfactory bond will be achieved by tamping the dry concrete.

Backfilling

Backfill with regular excavated soil when bank is complete.

Duct is usually laid in 100' (30m) sections once the trench is excavated. Therefore, concreting can be a continuous process.

Expansion and Contraction

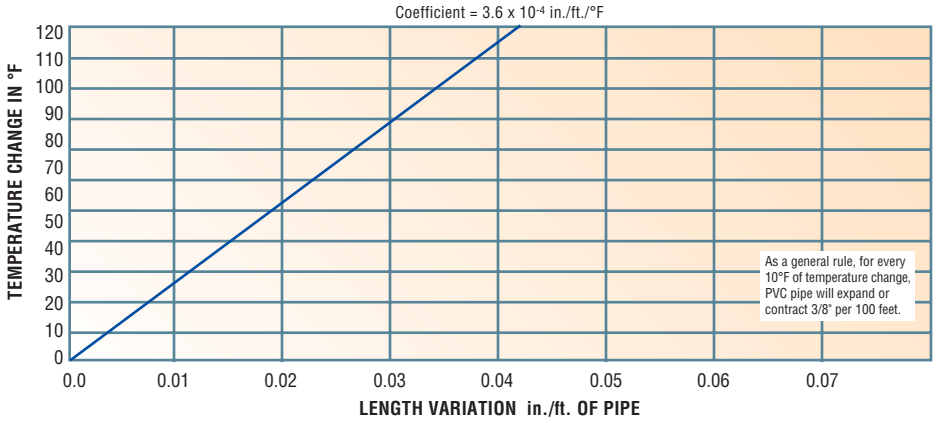
The following precautions should be exercised when extreme temperature variations are anticipated during the installation of IPEX Super Duct.

1. Allow extra duct footage at each tie-in for contraction when duct temperature is higher than soil temperature. Allow extra room for expansion if reverse condition exists.

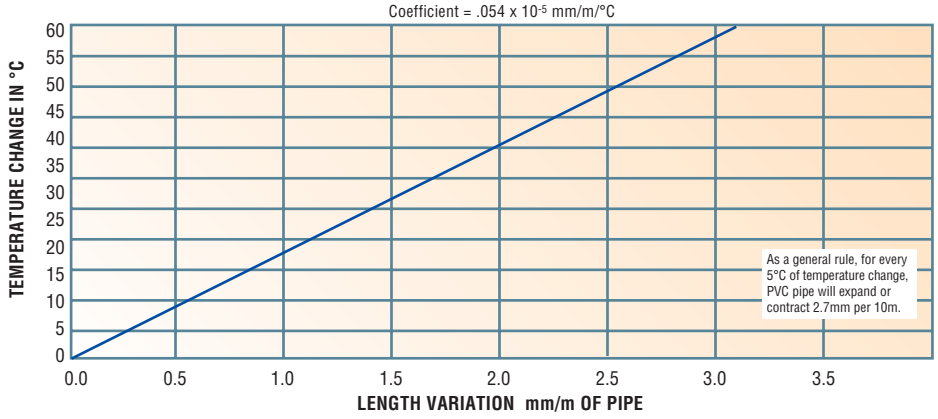
2. Backfill from tie-in point toward end of duct run.

The coefficient of thermal expansion of IPEX Super Duct is 3 x 10^{-5} in./in./°F (5.4 x 10^{-5} mm/mm/°C). These charts show the expansion that can be expected at various temperature ranges for unburied (unrestrained) duct.

PVC PIPE LENGTH VARIATION DUE TO TEMPERATURE CHANGE (°F)



PVC PIPE LENGTH VARIATION DUE TO TEMPERATURE CHANGE (°C)



Bends

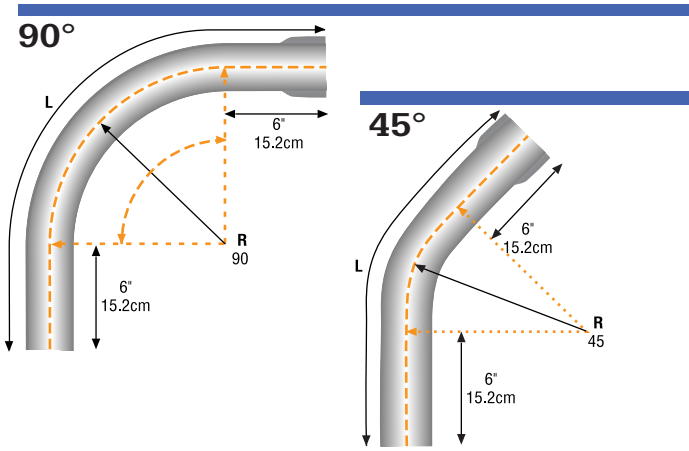
Radius of Bend (R)

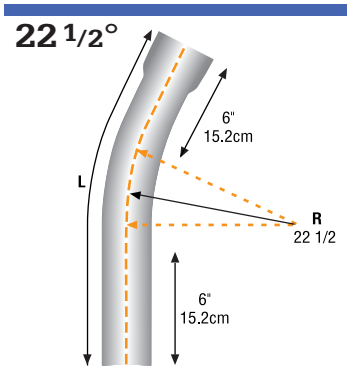
Pipe Diameter	24" (.61m)	36" (.91m)	42" (1.07m)	60" (1.52m)
2" (50mm)	90°/45°/22½°	90°/45°/22½°	90°/45°/22½°	90°/45°/22½°
3" (75mm)	90°/45°/22½°	90°/45°/22½°	90°/45°/22½°	90°/45°/22½°
3½" (90mm)	90°/45°/22½°	90°/45°/22½°	90°/45°/22½°	90°/45°/22½°
4" (100mm)	90°/45°/22½°	90°/45°/22½°	90°/45°/22½°	90°/45°/22½°
5" (125mm)	90°/45°/22½°	90°/45°/22½°	90°/45°/22½°	90°/45°/22½°
6" (150mm)	90°/45°/22½°	90°/45°/22½°	90°/45°/22½°	90°/45°/22½°

"L" (Including Tangents)

Angle	2" (50mm)	3" (75mm)	4" (100mm)	5" (125mm)	6" (150mm)
22½°	26¼" (.67m) radius	28" (.71m) radius	29" (.72m) radius	36" (.916m) radius	36" (.914m)
36"	36"	42"	60"	60"	
45°	31" (.79m) radius	40" (1.02m) radius	45" (1.14m) radius	60" (1.52m) radius	60" (1.52m)
24"	36"	42"	60"	60"	
90°	50" (1.27m) radius	69" (1.75m) radius	78" (1.98m) radius	107" (2.72m) radius	107" (2.72m)
24"	36"	42"	60"	60"	

Standard 90°, 45° and 22 1/2° bends are supplied with 6" (15.2cm) tangents at each end. Special radius bends are available upon request.





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