

SUMITOMO RECOMMENDED PROCEDURE**SRP SP-F04-026****TANDEM BLOWING PROCEDURE FOR
MULTIPLE BLOWING HEADS**

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1.0 General

1.1 There are three (3) recommended Extended Blowing techniques that can be used to install FutureFLEX Air Blown Fiber (ABF) Fiber Bundles beyond their standard blowing distances or through difficult tube routes (i.e.: those with numerous tight bends):

- Tandem Blowing
- Mid-Span Blowing with a Figure 8
- Segment Blowing with a Figure 8

1.2 **Table I** provides information on *Standard Blowing Distances Using One (1) Blowing Head*. This data can be very helpful in determining if an Extended Blowing technique will be required or should be considered.

1.3 This Sumitomo Recommended Procedures (SRP) describes the steps necessary to perform the Tandem Blowing Procedure.

1.4 Overview - A Tandem Blowing operation requires two (2) Blowing Head Equipment Kits.

1.4.1 The first Blowing Head, with Fiber Bundle reel, is set up at the start of the tube span (Building A).

1.4.2 The second Blowing Head, without Fiber Bundle reel, is set up at an intermediate point in the tube span (Building B).

1.4.3 The first Blowing Head is activated to install Fiber Bundle from Building A to Building B.

1.4.4 When the Fiber Bundle arrives at Building B, blowing operations are temporarily stopped and the exposed end of the Fiber Bundle is loaded into the second Blowing Head.

1.4.5 When ready, both Blowing Heads are activated and operated in tandem (together) to simultaneously move Fiber Bundle along from Building A to Building B and from Building B to the end of the tube span (Building C).

1.5 A Tandem Blowing operation can effectively double standard Fiber Bundle blowing distances.

1.5.1 It is a highly recommended Extended Blowing technique because it requires only minimal handling and exposure of the Fiber Bundle since the exposed Fiber Bundle is fed directly into the second Blowing Head with no Figure 8 required.

1.5.2 Since the two Blowing Heads will be at physically different locations, good communication and coordination between operating crews is essential.

1.6 Tandem Blowing can be performed with various pressure sources; Nitrogen Cylinder, Compressed Air Cylinder, or Air Compressor.

1.7 A minimum of four (4) personnel are required to perform this procedure.

- Blowing Head #1 Operator (at Building A)
- Blowing Head #2 Operator (at Building B)
- Blowing Head #2 Assistant (at Building B)
- Installer (at Building C)

1.8 Before installing a Fiber Bundle, the tube span must successfully pass the Tube Pressure and Tube Obstruction Tests. See Sumitomo Recommended Procedures **SRP: SP-F04-003** and **SRP: SP-F04-004**.

2. Safety Precautions

2.1 Pressurized Nitrogen - The use of inert (nonflammable) pressurized nitrogen (N₂) gas presents several safety concerns.

2.1.1 N₂ is a simple asphyxiate. If large amounts of nitrogen are released into a confined area, the nitrogen can displace the amount of oxygen in air necessary to support life. This can result in a loss of balance, dizziness, rapid reduction in the ability to perform movements, reduced consciousness of surroundings, as well as other symptoms that are included in the MSDS (Material Safety Data Sheet) available upon request from the N₂ Supplier. It is recommended that pressurized nitrogen only be released into a well-ventilated area.

2.1.2 When using pressurized nitrogen, there are no risks related to fire, reactivity, or other special hazards. Nitrogen is not listed as a carcinogen by NTP, IARC, or OSHA.

2.2 Compressed Air - The use of nonflammable pressurized compressed air (Atmospheric Air), either from a cylinder / tank or air compressor, presents no safety concerns.

2.2.1 Air is nontoxic and necessary to support life. There are no ventilation concerns.

2.2.2 Compressed Air at high pressures does present an unusual fire and explosive hazard in that it will accelerate the burning of materials to a greater rate than they would burn at normal atmospheric pressure.

2.2.3 When using pressurized air, there are no risks related to fire, reactivity, or other special hazards. Air is not listed as a carcinogen by NTP, IARC, or OSHA. An MSDS (Material Safety Data Sheet) is available upon request from the N2 Supplier.

2.3 Pressurized N2 Cylinders/Tanks
Transporting and handling pressurized N2 cylinders presents several safety concerns.

2.3.1 Any pressurized N2 cylinder is dangerous if damaged. N2 tanks must be properly capped when being transported and stored. N2 tanks must be secured in a stable tank dolly or chained to structure when uncapped for use.

2.3.2 A full size 300 cubic foot volume N2 tank weighs approximately 160 lbs. Two personnel should accomplish any manual lifting or moving of a tank. Exercise care and use proper lifting techniques.

2.4 Blowing Head Equipment Transit Case -
Transporting and handling the Blowing Head Equipment Transit Case presents several safety concerns.

2.4.1 The Transit Case weighs approximately 65 lbs. Normal transport is accomplished by pushing / pulling the Transit Case using its retractable handle and built-in wheels.

2.3.3 It is recommended that two personnel accomplish any manual lifting or moving of the Transit Case. Exercise care and use proper lifting techniques.

3.0 Reference Documents

3.1 Sumitomo Recommended Procedures, Blowing Equipment Setup Procedures **SRP: SP-F04-001** for BE200 Kits or **SP-F04-007** for BE300 Kits

3.2 Sumitomo Recommended Procedures, Fiber Bundle Installation Procedure **SRP: SP-F04-002** for BE200 Kits or **SP-F04-009** for BE300 kits.

3.3 Sumitomo Recommended Procedures, Tube Pressure Testing Procedure **SRP: SP-F04-003**.

3.4 Sumitomo Recommended Procedures, Tube Obstruction Testing Procedure **SRP: SP-F04-004**.

4.0 Equipment / Tools Required

The following equipment and tools are required to complete this procedure.

- 4.1** Nitrogen Cylinder - (Installer Provided)
- Industrial Grade Nitrogen; preferred pressure source
 - Inert (nonflammable) gas
 - Dry or with no more than 4 ppm moisture content (H₂O)
 - Oil / contaminant free output
 - 300 cu. ft. (approx.) volume tank size recommended
 - 2200-to-2500 psi (approx.) pressure charge

Note: Typically, one 300 cu. ft. tank of nitrogen will be required to install (approx.) 3000' - 4000' of Fiber Bundle and last about 35-45 minutes. This "conservative estimate" can vary depending upon tube route orientation, Fiber Bundle size, Tube Cable type, and operating practices.

Special Note: The total number of N2 Tanks required to accomplish Tandem Blowing operations must be considered. Typically, at least two (2) tanks (maybe more) will be needed at Building A Blowing Head #1 location and one (1) tank (maybe two) at Building B Blowing Head #2 location; total three (3) tanks minimum. Very long or tortuous tube span routes may require more.

Special Note: The use of a Dual Tank Set-up, especially at Building A Blowing Head #1 location, is strongly recommended to support uninterrupted extended blowing operations. Depending on total tube span length, a Dual Tank Set-up may also be beneficial at Building B Blowing Head #2 location. See Sumitomo Recommended Procedures **SRP: SP-F04-001** and **SP-F04-002** for the BE200 Kit or **SP-F04-007** and **SP-F04-009** for the BE300 Kit.

4.2 Pressure Regulator Assembly with 8mm Tubing Adapter SEL P/N: BEREG02 Single-Stage (Installer provided and strongly recommended).

4.3 Dual-Tank Isolation Valve Kit (BEISOV1) (Installer provided and strongly recommended).

4.4 Two (2) Blowing Head Equipment Kits either the BE200 or BE300 (BEx00RM, BEx00RS, or BEx00RY). See Sumitomo Recommended Procedures **SRP: SP-F04-001** for BE200 Kit or **SP-F04-007** for BE300 Kit details.

4.5 Tube Couplings (DE08MC2) - (Installer Provided).

4.6 Tube Cap (DE08MA) (Installer provided).

4.7 Two (2) Cylinder Adapters (BEREGCA) (Installer provided); required if using Compressed Air Cylinders as pressure source.

4.8 An adjustable wrench, extra tubing (both clear and black) and extra tee-couplers are (Installer Provided) requirements.

4.9 Soft, clean cotton gloves or similar cloth type gloves are required.

4.10 Alternate Pressure Source - Although a tank of nitrogen is the preferred pressure source because of its cleanliness, general convenience, inexpensive cost, and ease of portability, compressed air from either a Compressed Air Cylinder or an Air Compressor can be used as an alternate pressure source.

4.11 Compressed Air Cylinder (Installer provided)

- Dry Grade Compressed Air
- Nonflammable gas (atmospheric air)
- Dry or with no more than 10 ppm moisture
- Oil - "Lubricant" and Contaminant free
- 300 cu. ft. volume tank size recommended
- 2200-to-2500 psi (approx.) tank pressurization

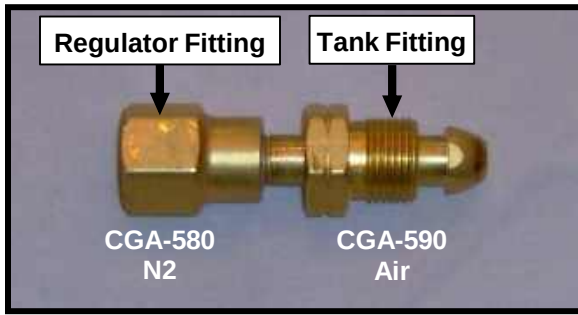
Note: *Different types or "grades" of Compressed Air are available. The "purer" grades with such names as Zero Grade, Vehicle*

Emission Grade, Scientific Grade, and Accurate Grade undergo additional refining processes so they contain fewer impurities (hydrocarbons) and have less moisture content. It is not necessary to use these more expensive and "purer" grades of air for blowing operations.

Note: *Performance-wise, Compressed Air supplied in a Cylinder performs the same as Nitrogen. There are no differences in the blowability of Fiber Bundle nor operation of the Blowing Head.*

Note: *Typically, one 300 cu. ft. tank of compressed air will be required to install (approx.) 3000' - 4000' of Fiber Bundle and last about 35-45 minutes. This "conservative estimate" can vary depending upon tube route orientation, Fiber Bundle size, Tube Cable type, and operating practices.*

Important Note: *Compressed Air Cylinders are supplied with a Female left-hand thread tank fitting (CGA-590). Pressure Regulator P/N: BEREG02 supplied in the Blowing Head Equipment Kit have a Male right-hand thread Nut (CGA-580). A CGA-590 Industrial Air Cylinder-to-CGA-580 Nitrogen Regulator Cylinder Adapter is required to connect the Pressure Regulators to the tank fitting. One (1) Cylinder Adapter is required for each Pressure Regulator used. See Fig. 1.*

**Figure 1**

Nitrogen Regulator to Air-Cylinder Adapter

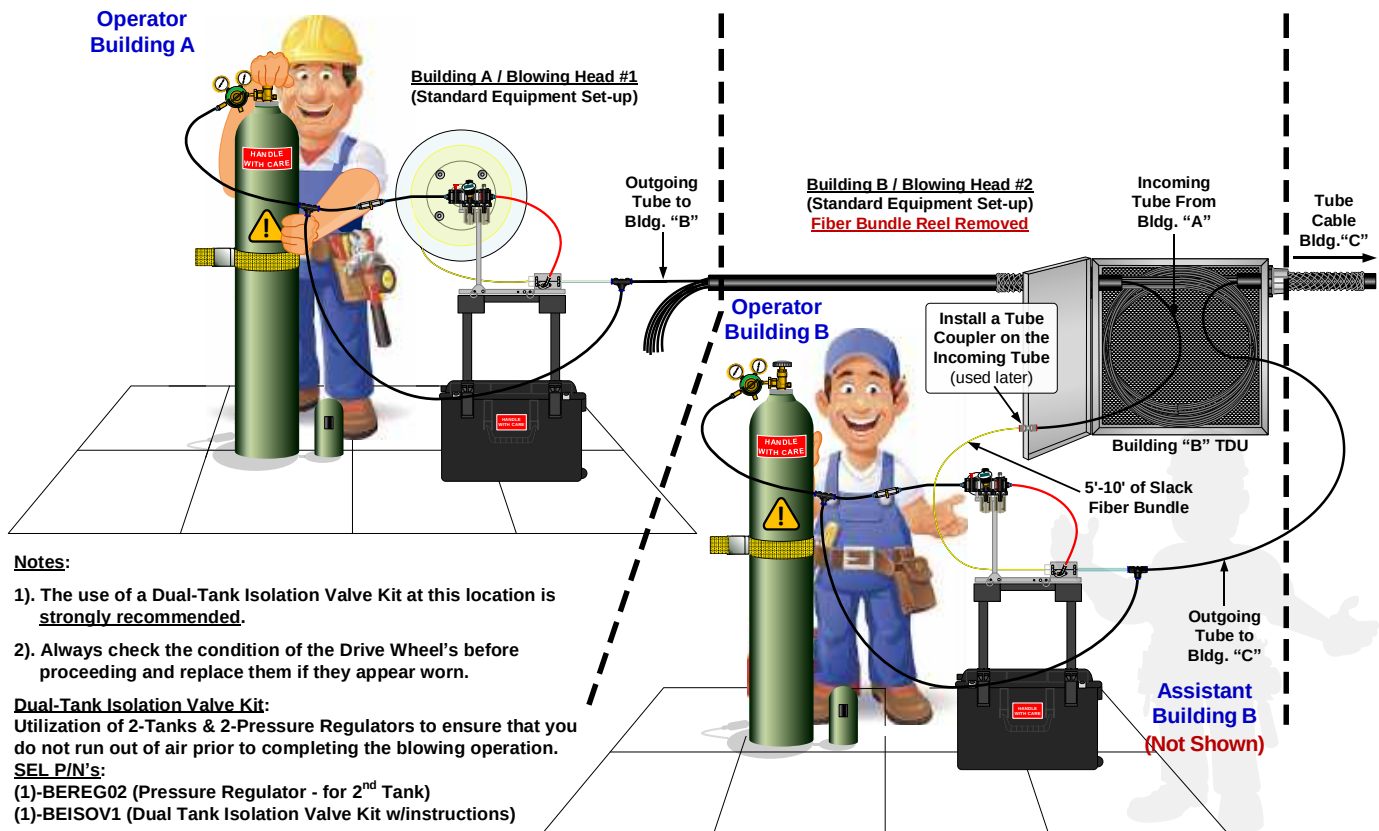
4.12 Air Compressor (Installer provided)

- **Output:** Dry or with no more than 10 ppm moisture content; Often requires use of a Secondary Dryer
- **Output:** Lubricant and Contaminant free
- **Output:** Flow Rate (capacity) at least 12 scfm
- **Output:** pressure at least 200 psi

Note: If an Air Compressor is to be used, additional Air and Coalescer Filters and a secondary Desiccant-type Dryer are strongly recommended and must be of compatible output flow and pressure ratings with an Air Compressor. Also consider the following potential issues first; Power source / requirements? Physical size of Compressor? Portability? Distance Compressor must be set up from Blowing Head? Fittings necessary to connect Compressor output to a Pressure Regulator? Noise if use indoors?

5.0 Equipment Layout

5.1 See Fig. 2 for a typical Tandem Blowing Equipment layout.

**Figure 2**

Tandem Blowing Equipment Layouts at Building "A" and Building "B"

6.0 Blowing Head Equipment Set-up

Note: The steps below assume a tube span that begins at Building A, runs through Building B, and terminates at Building C. Building A contains the entry point Fiber Termination Unit (FTU). Building B contains a mid-span Tube Distribution Unit (TDU). Building C contains the exit point FTU.

Note: Before installing Fiber Bundle, verify Tube Pressure and Tube Obstruction Test Procedures (Sumitomo Recommended Procedures **SRP: SP-F04-003** and **SRP: SP-F04-004**) have been successfully accomplished from Building A to Building C.

6.1 Establish communications between Blowing Head Operator #1 located at Building A, Blowing Head Operator #2 and Assistant located at Building B, and Installer located at Building C.

6.2 At Buildings A, B, and C, locate and identify correct Tube Cable and tube scheduled for Fiber Bundle installation.

6.3 Evaluate all Fiber Bundle entry and exit point locations. Ensure they are well ventilated to disperse nitrogen released during installation operations. If necessary, relocate Blowing Equipment to ventilated areas and use jumper tubing to reach entry point FTU and mid-span TDU. If necessary, use jumper tubing at exit point FTU and extend tube span to a ventilated area. If required, provide auxiliary means of ventilation.

6.4 At Building A, set up Blowing Head #1 and fiber reel in accordance with Sumitomo Recommended Procedures **SRP: SP-F04-001** for the **BE200** and **SRP: SP-F04-007** for the **BE300**. See Fig 3.

6.4.1 Verify Fiber Bundle Drive Wheels and Air Seals are in good shape / do not show signs of wear. Change if required.

6.4.2 Consider using Dual Tank Set-up at Building A.

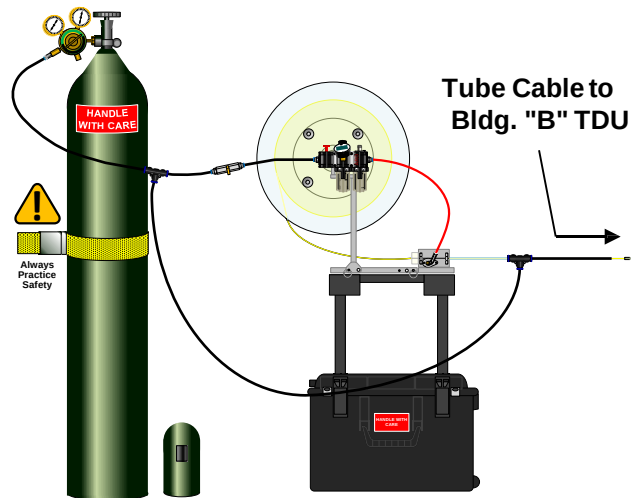


Figure 3

Blowing Head #1 set up at Building A per normal procedures

6.5 At Building B, set up Blowing Head #2 in accordance with Sumitomo Recommended Procedures **SRP: SP-F04-001** for the **BE200** and **SRP: SP-F04-007** for the **BE300** See Fig. 4.

6.5.1 No fiber reel is used.

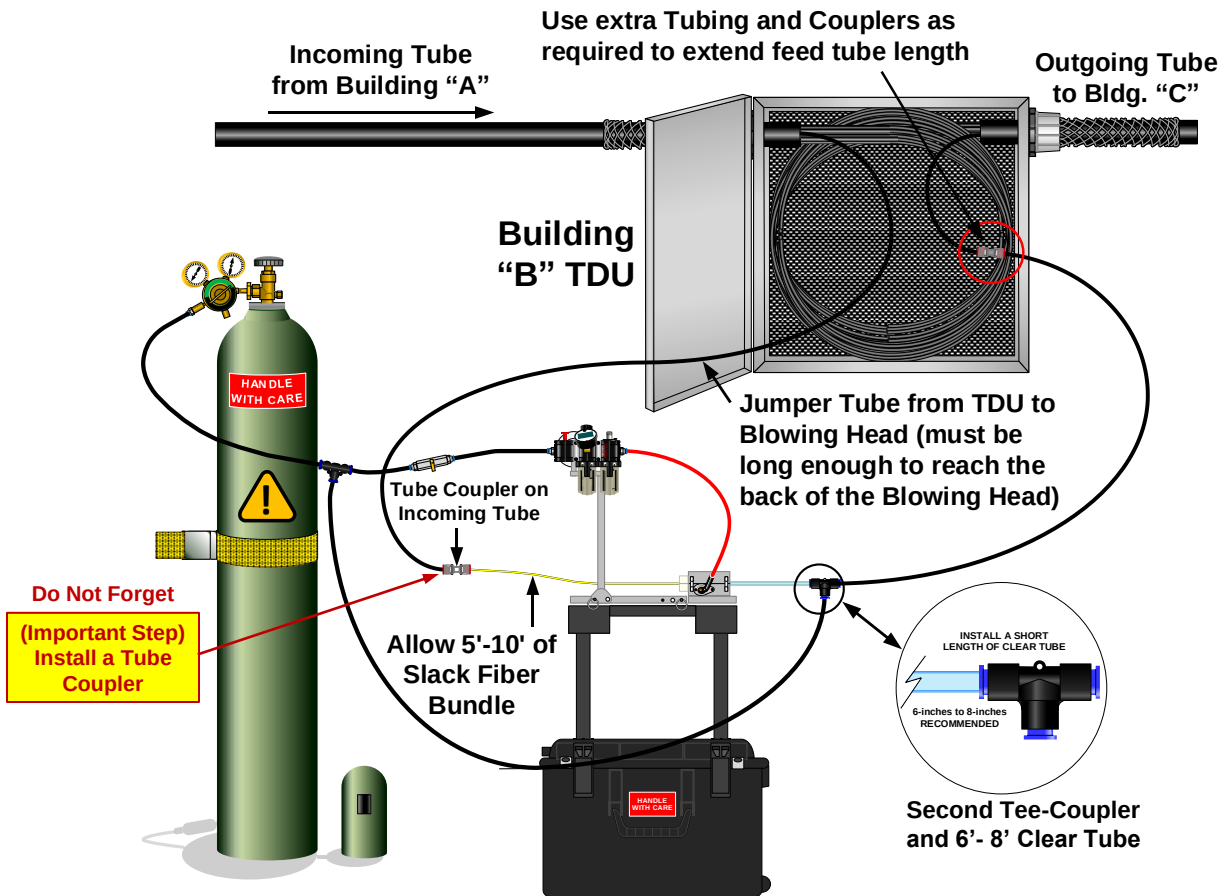
6.5.2 Push-fit only a short length of 8mm Clear Tube into one side of Second Tee Coupling. (This short length reduces how much tubing has to be stored later.) See Fig. 4.

6.5.3 Verify Fiber Bundle Drive Wheels and Air Seals are in good shape / do not show signs of wear. Replace as required.

6.5.4 Consider using Dual Nitrogen Tank Set-up at Building B.

6.6 At Building B TDU, uncouple tube span and perform following steps. See Fig. 4.

6.6.1 Install jumper tubing between incoming tube from Building A and Blowing Head #2 area.

**Figure 4**

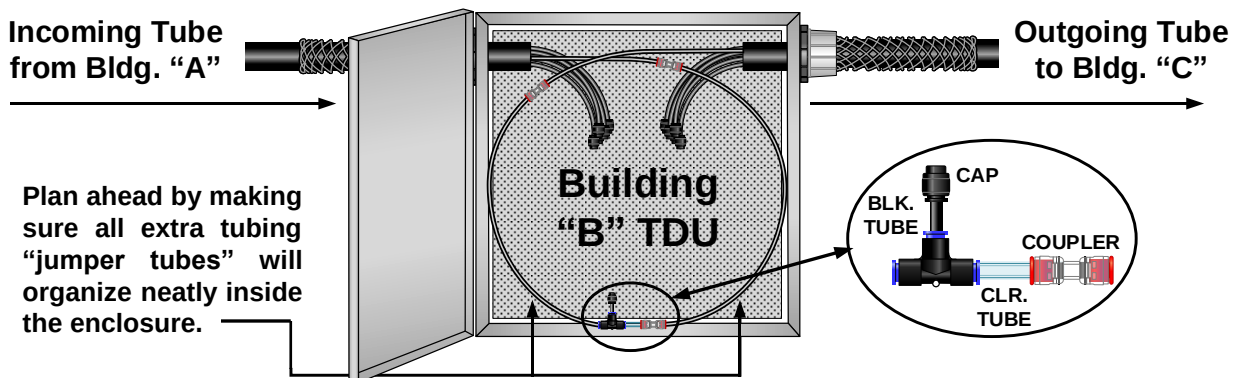
Blowing Head #2 Head Set Up at Building B

6.6.2 Critical Step. Verify a Tube Coupling is installed on end of incoming jumper tubing from Building A.

6.6.3 Install jumper tubing between Second Tee Coupling of Blowing Head #2 and outgoing tube to Building C.

6.6.4 Key Step. Test fit and verify all tubing used can be coiled and neatly stored inside Building B TDU after blowing operations are completed. This step must be done before blowing operations begin. **See Fig. 5.**

6.6.5 After the Jumper Tubing test fit is done, uncouple tubes and get ready to receive Fiber Bundle.

**Figure 5**

Test Fit all Jumper Tubing inside Building B TDU before beginning blowing operations

7.0 First Blowing Operation

7.1 At Building B TDU, uncouple tube span and ensure Tube Coupling is installed on incoming tube from Building A.

7.2 Blowing Head #1 Operator opens tank Supply Valve, sets initial operating pressures, pressurizes Building A-to-Building B tube segment, and obtains verification that airflow exists at Building B TDU. See Sumitomo Recommended Procedures **SRP: SP-F04-002 for BE200** and **SRP: SP-F04-009 for BE300**

7.3 When ready, install Fiber Bundle from Building A to Building B in accordance with Sumitomo Recommended Procedures **SRP: SP-F04-002 for BE200** and **SRP: SP-F04-009 for BE300**

7.4 When Fiber Bundle reaches Building B TDU, Blowing Head #2 Operator instructs Blowing Head #1 Operator to slow the Fiber Bundle movement.

CAUTION: Handle exposed Fiber Bundle with care and wear soft, clean cotton gloves or similar protection to avoid contaminating Fiber Bundle jacket.

7.5 Assistant at Blowing Head #2 handles and supports Fiber Bundle as it exits tube.

Note: A 5' - 10' exposed length of Fiber Bundle is recommended. This footage will be used as a slack loop when Tandem Blowing operations are started.

7.6 When a 5' -10' slack loop length of Fiber Bundle is available at Building B TDU, Blowing Head #2 Operator instructs Blowing Head #1 Operator to close Motor Rate Control Valve and stop Fiber Bundle movement. **See Fig. 4.**

7.7 If there is a Sufficient Volume of air to continue and, if the Building B Operator is setup and ready to continue, Proceed to Section 8. If either of these conditions are Not met you may choose to close the Tank Supply Valve and Replace the Tank while Building B Operator prepares Blowing Head #2.

Note: It is suggested to check Blowing Head #1 Tank Supply pressure at this time. This is the best time to change tanks to avoid interrupting Blowing operations later.

Note: This is also a good time to replace drive wheels on Blowing Head #1.

8.0 Tandem Blowing Operations

8.1 Blowing Head #2 Operator loads exposed end of Fiber Bundle into Blowing Head #2 in accordance with Sumitomo Recommended Procedures **SRP: SP-F04-001 for BE200** and **SRP: SP-F04-007 for BE300**

See Fig. 6.

8.2 Assistant prepares to handle slack loop footage and guide exposed Fiber Bundle into back of Blowing Head #2.

8.3 Blowing Head #2 Operator assumes control of Tandem Blowing operation.

8.4 Blowing Head #2 Operator opens Tank Supply Valve at Blowing Head #2, sets initial operating pressures, pressurizes Building B-to-Building C tube segment, and obtains verification that airflow exists at exit Building FTU. See Sumitomo Recommended Procedures **SRP: SP-F04-002 for BE200** and **SRP: SP-F04-009 for BE300**.

8.5 Verify Building A-to-Building B tube segment is still pressurized; Air Flow pressure exists. If not, the Building A Operator must first re-charge (pressurize) the line.

8.6 When ready, Blowing Head #2 Operator instructs Blowing Head #1 Operator to begin blowing operations.

8.7 Blowing Head #1 Operator slowly opens Motor Rate Control Valve and starts Fiber Bundle movement through the Building A-to-Building B tube segment again.

8.8 Blowing Head #2 Operator and Assistant watch for movement of exposed Fiber Bundle by observing slack loop footage.

8.9 When slack loop footage begins to increase, Blowing Head #2 Operator slowly opens Motor Rate Control Valve and starts Fiber Bundle installation while Assistant carefully guides the Fiber Bundle into the back of the Blowing Head. **See Fig. 6.**

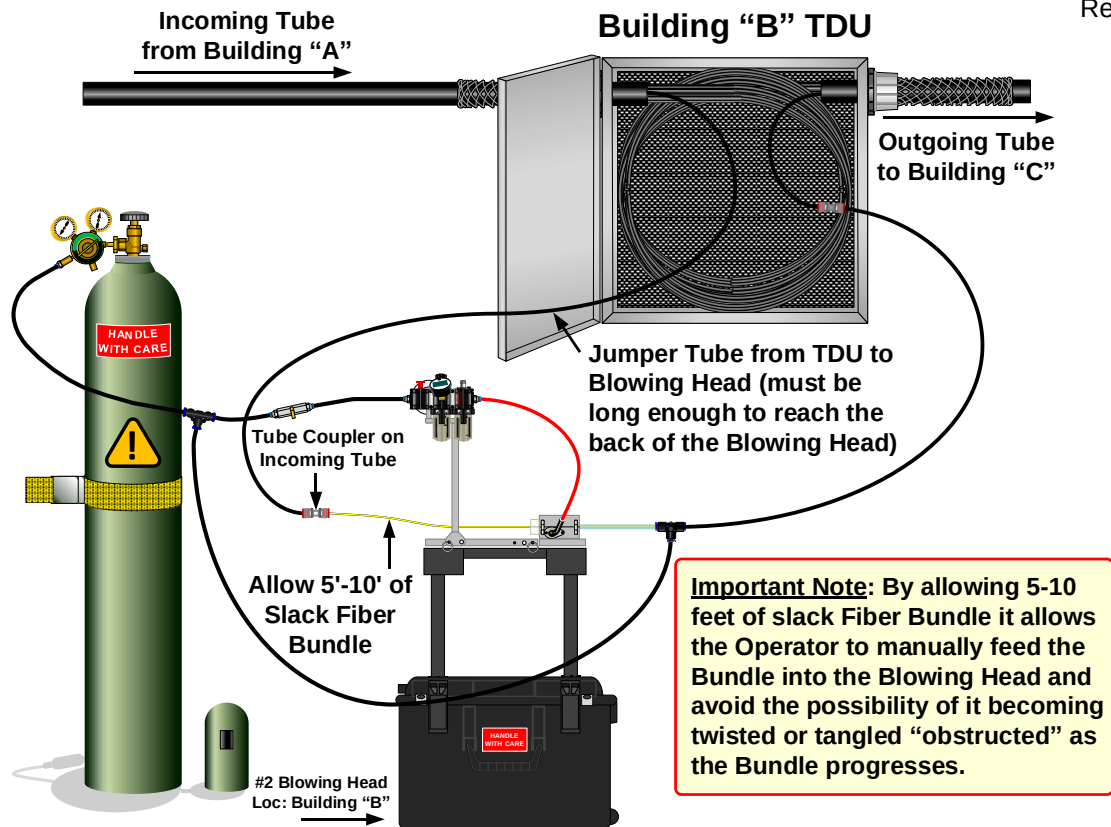


Figure 6

Tandem Blowing Operations at Blowing Head #2 Location
Key Point: Adjust blowing speed to maintain 5'-10' Fiber Bundle Slack.

8.10 Blowing Head #2 Operator tries to match Fiber Bundle installation speed with Blowing Head Operator #1.

8.10.1 Critical Step. Always maintain open communication lines between the two Blowing Head locations.

8.10.2 Should one Blowing Head operation slow down, speed up, or stop, the other Blowing Head operation must follow suit immediately.

8.10.3 Always maintain a sufficient length of Fiber Bundle slack loop footage at Blowing Head #2 to avoid damaging Fiber Bundle.

8.10.4 If possible, slowly increase installation speed of both Blowing Heads to a comfortable level but always maintain sufficient slack length footage behind Blowing Head #2 to avoid damaging Fiber Bundle.

9.0 Complete Blowing Operations

9.1 Installer at Building C informs both Blowing Head Operators when Fiber Bundle reaches exit Building FTU.

9.2 Both Blowing Head Operators adjust Motor Rate Control Valves to slow Fiber Bundle movement.

9.3 A 10' - 15' exposed length of Fiber Bundle is recommended for fiber termination purposes; more or less length if required / desired. Installer at Building C informs both Blowing Head Operators when enough Fiber Bundle length is available at exit Building.

9.4 Blowing Head #1 Operator then closes Motor Rate Control Valve to stop Fiber Bundle payoff from reel. Close Tank Supply Valve and wait for tube span to de-pressurize before opening Blowing Head.

9.5 Blowing Head #2 Operator continues to slowly install Fiber Bundle, decreasing exposed slack loop footage. Assistant continues to help guide Fiber Bundle and jumper tubing toward back of Blowing Head.

9.6 Key Step. Blowing Head #2 Operator closes Motor Rate Control Valve and stops Fiber Bundle movement when Tube Coupling is about 1 foot behind back of Blowing Head #2. **See Fig. 7A.**

9.7 Do not close Tank Supply Valve. Maintain Air Flow pressure in Building B-to-Building C tube segment. Work quickly to complete next step.

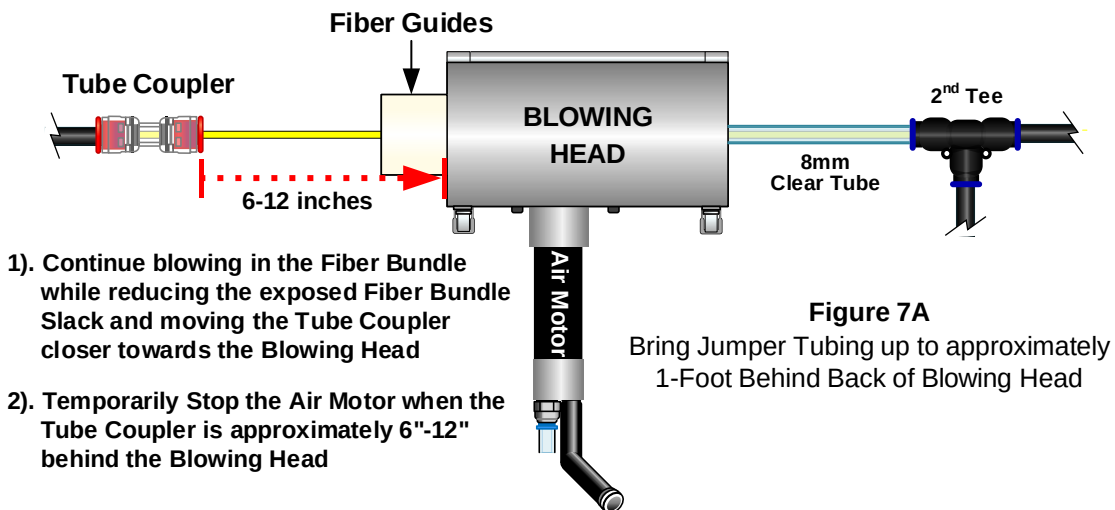
9.8 Remove the Fiber Guides.

CAUTION: During next step, go slowly to avoid damaging Fiber Bundle.

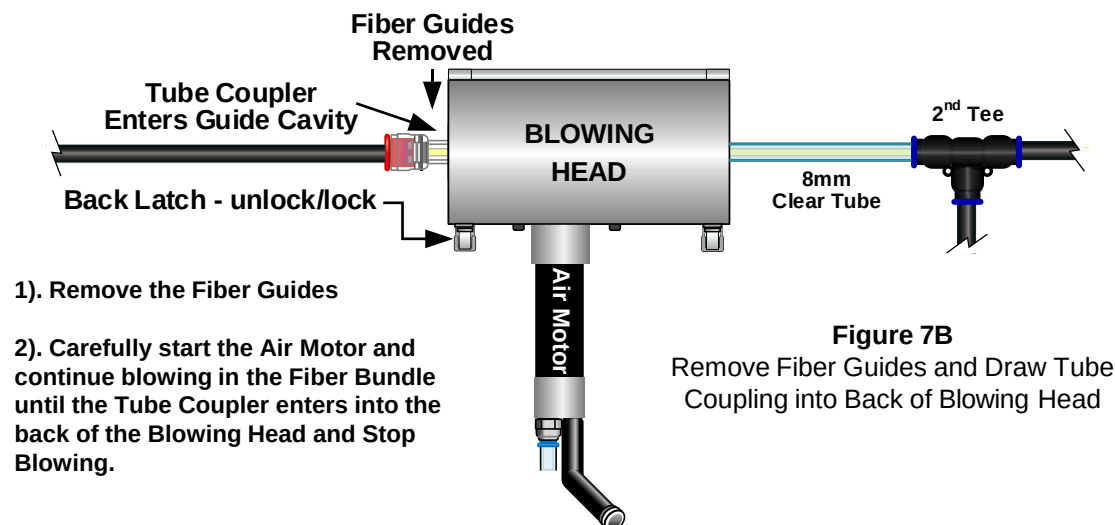
9.9 Blowing Head #2 Operator slowly opens Motor Rate Control Valve and moves Fiber Bundle and Tube Coupling into back of Blowing Head #2. **See Fig. 7B.**

9.9.1 Blowing Head Operator #2 and Assistant must work together to avoid damaging Fiber Bundle during this step.

9.9.2 Critical Step. Try to draw Tube Coupling into back of Blowing Head as far as possible but do not "jam" tubing and Fiber Bundle.



- 1). Continue blowing in the Fiber Bundle while reducing the exposed Fiber Bundle Slack and moving the Tube Coupler closer towards the Blowing Head
- 2). Temporarily Stop the Air Motor when the Tube Coupler is approximately 6"-12" behind the Blowing Head



- 1). Remove the Fiber Guides
- 2). Carefully start the Air Motor and continue blowing in the Fiber Bundle until the Tube Coupler enters into the back of the Blowing Head and Stop Blowing.

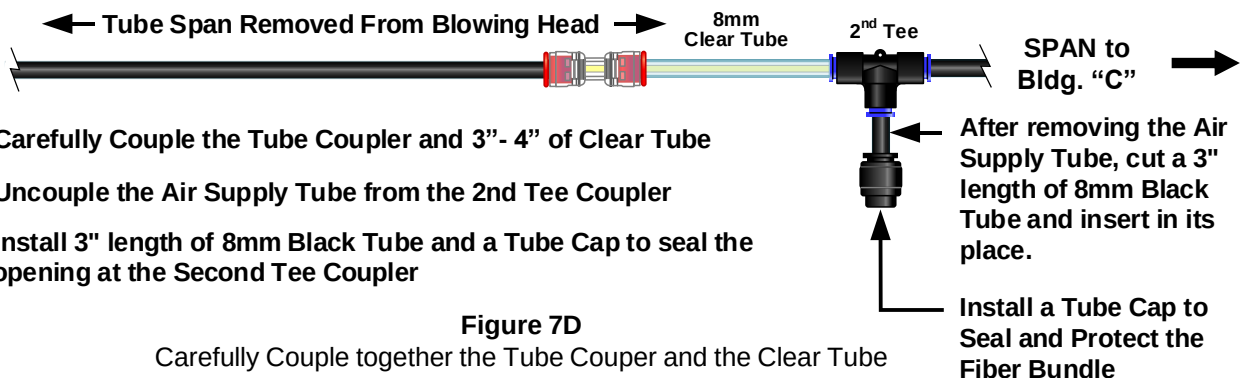
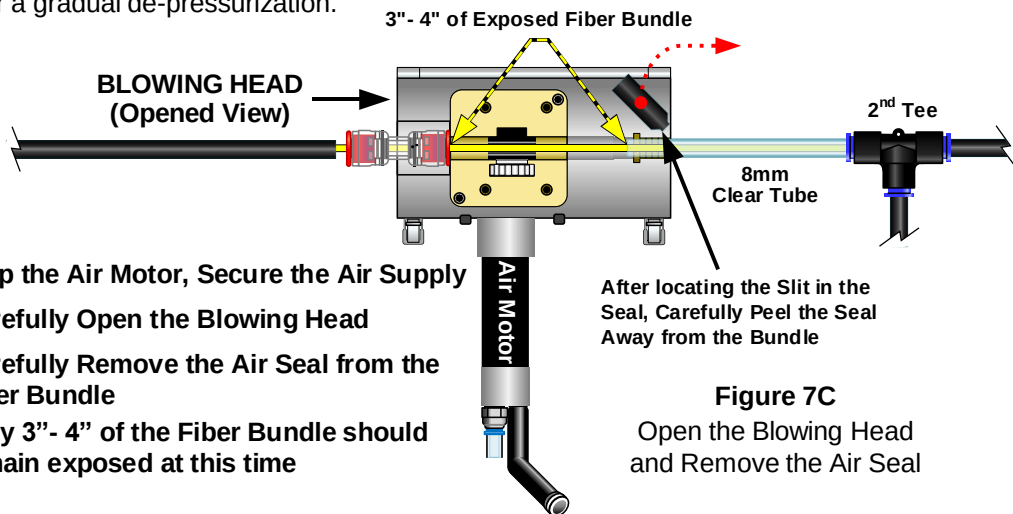
9.10 Blowing Head #2 Operator closes Motor Rate Control Valve and stops Fiber Bundle movement when Tube Coupling is drawn into back of Blowing Head.

9.11 Close Tank Supply Valve. Work quickly to complete next step.

9.12 Do not wait for Building B-to-Building C tube segment to fully de-pressurize. Be aware that residual Air Flow pressure still exists in the tube segment. Carefully crack open the latches so the latches catch on the latch hooks at Blowing Head #2 to allow for a gradual de-pressurization.

9.13 Carefully remove Fiber Bundle Air Seal from Fiber Bundle. Approximately 3" - 4" of Fiber Bundle will be exposed. **See Fig. 7C.**

9.14 Key Step. Carefully bring Tube Coupling and 3" - 4" length of 8mm Clear Tube together and couple. Any Fiber Bundle slack may wave or snake inside 8mm Clear Tube as connection is made. **See Fig. 7D.**



10.0 Complete the Installation - Building A

10.1 At Building A, allow Building A-to-Building B tube segment to de-pressurize / vent.

10.2 Leave Fiber Bundle installed in Blowing Head for additional protection.

10.3 Carefully manually pay off recommended 10'-15' of Fiber Bundle length from reel for fiber termination purposes; more or less length as required. When enough length is available, cut the Fiber Bundle from reel.

10.4 When tube span has de-pressurized, open Blowing Head and carefully remove Fiber Bundle Air Seal from around Fiber Bundle.

10.5 Carefully uncouple Supply Tubing from Branch Leg of Second Tee Coupling.

10.6 Carefully uncouple Second Tee Coupling and 8mm Clear Tube from tube span.

10.7 Carefully slide Second Tee Coupling and 8mm Clear Tube off cut end of Fiber Bundle and retain.

10.8 Coil and organize Fiber Bundle and protect it from accidental damage by storing inside FTU.

10.9 Carefully install a Fiber Bushing around Fiber Bundle and seat it in open end of tube to seal opening.

10.10 Secure loose end of Fiber Bundle to reel. Remove Fiber Bundle reel from Payoff Stand and install reel's protective cover (Clamshell).

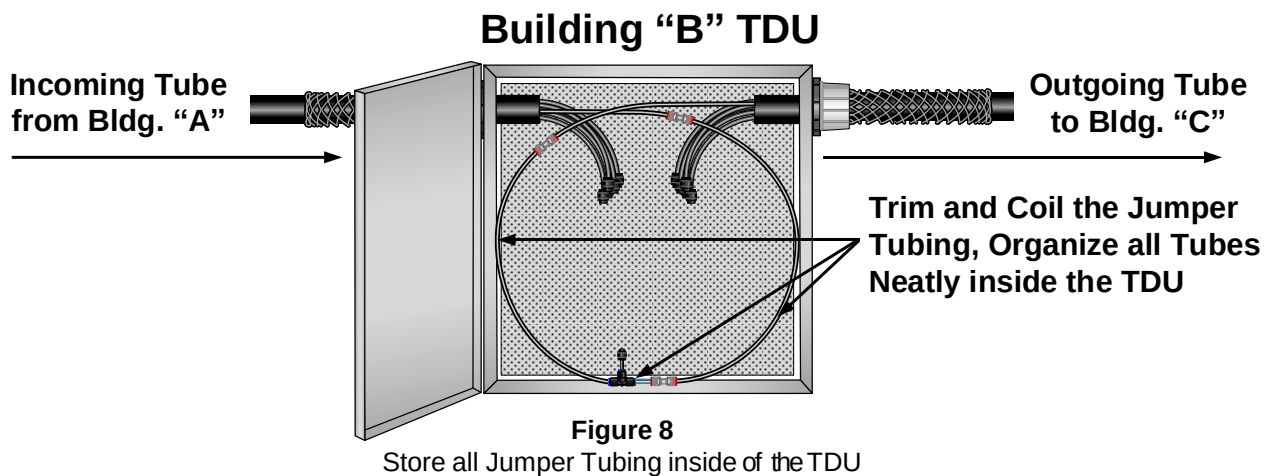
11.0 Complete the Installation - Building B

11.1 At Building B TDU, allow Building B-to-Building C tube segment to fully de-pressurize / vent.

11.2 Carefully uncouple Supply Tubing from Branch Leg of Second Tee Coupling.

11.3 Push-fit a short length of tubing into Branch Leg of Second Tee Coupling. Push-fit a Tube Cap onto end of short tubing to seal Second Tee Coupling. **See Fig. 7D.**

11.4 Carefully coil all jumper tubing and store inside Building B TDU. **See Fig. 8.**



12.0 Complete the Installation - Building C

12.1 At Building C FTU, allow the Building B-to-Building C tube segment to de-pressurize / vent.

12.2 Carefully install a Fiber Bushing around Fiber Bundle and seat it in open end of tube to seal opening.

12.3 Remove and retain the reusable Fiber Bundle Blowing Tip.

Note: It is recommended to leave the Blowing Tip installed on the Fiber Bundle and cut off the first 2" - 3" of Fiber Bundle. This technique will help prevent the small Blowing Tip from being misplaced.

12.4 Coil and organize Fiber Bundle and protect it from accidental damage by storing inside FTU.

12.5 This completes the Tandem Blowing Procedures.

TABLE 1

(APPROXIMATE DISTANCES LISTED ARE BASED ON USING ONE (1) BLOWING HEAD)

Non-Ribbonized Fiber Bundles - (PEF *Polyethylene Extruded Foam* Jacket)

6 and 12 FIBER BUNDLES (2mm OD)	APPROXIMATE BLOWING DISTANCE
All OSP Tube Cables All MTIO Tube Cables	1500 meters or 5000 feet 1500 meters or 5000 feet
TRC (Riser) Tube Cables	1000 meters or 3300 feet
TGX (General Purpose) Single Tube and TP2 (Plenum) Tube Cables	600 meters or 1950 feet 600 meters or 1950 feet

Non-Ribbonized Fiber Bundles - (PEF *Polyethylene Extruded Foam* Jacket)

24-FIBER BUNDLES (3mm OD)	APPROXIMATE BLOWING DISTANCE
All OSP Tube Cables All MTIO Tube Cables	1800 meters or 6000 feet 1800 meters or 6000 feet
TRC (Riser) Tube Cables	1000 meters or 3300 feet
TGX (General Purpose) Single Tube and * TP2 (Plenum) Tube Cables	300 meters or 1000 feet 300 meters or 1000 feet

* **Note:** (24f Bundles in Tube Cables with Seven (7) or Greater Tube Count Only)**Non-Ribbonized Fiber Bundles** - (PEF *Polyethylene Extruded Foam* Jacket)

48-FIBER BUNDLES (3.7mm OD)	APPROXIMATE BLOWING DISTANCE
All OSP Tube Cables All MTIO Tube Cables	1500 meters or 5000 feet 1500 meters or 5000 feet
TRC (Riser) Tube Cables	1000 meters or 3300 feet
TGX (General Purpose) Single Tube and * TP2 (Plenum) Tube Cables	228 meters or 750 feet 228 meters or 750 feet

* **Note:** (48f Bundles in Tube Cables with Seven (7) or Greater Tube Count Only)**See Next Page (Continued)**

TABLE 1 (Cont.)

(APPROXIMATE DISTANCES LISTED ARE BASED ON USING ONE (1) BLOWING HEAD)

Ribbonized Fiber Bundles - (PVDF *Polyvinylidene Fluoride* Jacket)

PVS 48/72-FIBER BUNDLES (3.1-3.7mm OD)	APPROXIMATE BLOWING DISTANCE
OSP Tube Cables (without lubricant)	700 meters or 2300 feet
OSP Tube Cables (with lubricant)	1220 meters or 4000 feet
TRC (Riser) Tube Cables	800 meters or 2600 feet
TGX (General Purpose) Single Tube and * TP2 (Plenum) Tube Cables	228 meters or 750 feet 228 meters or 750 feet

* **Note:** (48f & 72f Bundles in Tube Cables with Seven (7) or Greater Tube Count Only)**Ribbonized Fiber Bundles** - (PVDF *Polyvinylidene Fluoride* Jacket)

PV3-PV4 72-FIBER BUNDLES (4.1 mm OD)	APPROXIMATE BLOWING DISTANCE
OSP Tube Cables (without lubricant)	650 meters or 2100 feet
OSP Tube Cables (with lubricant)	1200 meters or 3900 feet
TRC (Riser) Tube Cables	750 meters or 2450 feet
TGX (General Purpose) Single Tube and * TP2 (Plenum) Tube Cables	200 meters or 650 feet 200 meters or 650 feet

* **Note:** (72f Bundles in Tube Cables with Seven (7) or Greater Tube Count Only)**General Notes:**

- A. Tube Lubrication using the Application Syringe and Sponges Must be performed on all Tube(s) accepting a FP48PVS, FP72PVS, FP72PV3 or FP72PV4 Fiber Bundle. This procedure Must be performed no more than 1 hour prior to blowing in a Fiber Bundle. This procedure applies to the FPxxPVx Fiber Bundles Only. See SRP: SP-F04-053 for procedure details.
- B. All distances given are approximate values only and can vary greatly.
- C. Several key factors heavily influence actual blowing distances:
 - ✓ The location, number, and severity of bends in a Tube span route.
 - ✓ The fiber bundle size being installed (2mm O.D., 3mm O.D. 3.1mm O.D. 3.7mm O.D. & 4.1 O.D.)
 - ✓ The Tube Cable type or types being blown through.
- D. 24f, 48f, and 72f fiber bundles are slightly stiffer than the 6f and 12f fiber bundles and are not as flexible. Consequently, 24f, 48f and 72f fiber bundle blowing distances may be slightly less than the approximate distances noted if installed in Tube Cable routes with numerous tight bends.
- E. Extended Blowing Techniques can be used to install fiber bundles beyond the standard blowing distances given above or to help get fiber bundles through difficult Tube routes (i.e.: those with numerous tight bends). Refer to SRPs:
 - ✓ SP-F04-026 Tandem Blowing Procedure.
 - ✓ SP-F04-027 Mid-Span Blowing with a Figure 8 Procedure.
 - ✓ SP-F04-028 Segment Blowing with a Figure 8 Procedure.

Important Note: As a General Practice, always avoid Tight Bends for all Tube Cable types and always focus on minimizing the total quantity of bends for all installed Tube Spans.