3.1 Joint Requirements: There are two types of bell fits, interference fit or clearance fit, depending on the specification of the conduit to be used. An “interference fit” means that the spigot will not dry fit to the base of the bell and will lodge about two-thirds deep into the bell. A clearance fit means that the spigot will slide all the way to the base of the bell without application of cement. Interference fits, therefore are tighter and provide watertight joints easily; clearance fits will leave small gaps between the inside of the bell and the spigot and may require extra in jointing if watertight joints are required.

3.2 Solvent Cement: Select the proper type of cement to fit the job requirements. The cement should meet the requirements of ASTM D 2564. Three types of cement are available, based on the viscosity, regular bodied, medium bodied and heavy bodied. Regular bodied cement, such as CANTEX #99, is suitable for most conduit applications up through 6" size. For better gap filling needs, medium-bodied cement such as CANTEX #5 should be selected. For conduit 6” and larger where a watertight joint is needed or for extremely hot weather use, select a heavy bodied cement such as CANTEX #16. For cement joints in corrugated ENT or corrugated fiber optic conduit, cement such as CANTEX #50 ENT cement should be used.

3.3 Solvent Cement Storage: Store sealed cement containers in temperature between 40°F (5°C) to 70°F (31°C) when not in use. Before use, check to see that the cement is fluid and not lumpy or gelled. If lumpy or gelled, discard the cement; do not attempt to liquefy or dilute with cement primer. DO NOT USE OPEN FLAME OR ELECTRIC HEATERS TO WARM CEMENT.

3.4 Surface Preparation: Wipe joint surfaces clean of dirt, moisture or other contaminants. If the joining surfaces are extremely dirty or coated with oil, wipe thoroughly and do not attempt to make a cement application until all evidence of moisture is gone. Extremely hot jointing areas (90°F or above) should be cooled by shading or application of a damp cloth. If a damp cloth is used, area should be allowed to dry before applying cement. Hot surfaces dry the cement rapidly and can cause insufficient welding if liquid cement is not evident on the surface when the bell and spigot are joined. Use of a heavier, slower drying cement may be appropriate when it is impractical to cool the joints.

3.5 Application of Cement: For most conduit joints, a single application of cement on the spigot to a length equal to the bell depth is sufficient. On conduit of 1” or smaller, use a dauber applicator which is supplied in the lid of the cement container. On larger sizes, use a small natural bristle paint brush of a width approximately one-half the diameter of the pipe. (Example: For 4” pipe, use a 2” wide brush.) Apply the cement quickly and evenly around the spigot and insert into the bell or fitting while the cement is still liquid.

3.6 Makeup: Insert the spigot fully into the bell and apply a one-quarter twist on the spigot section as insertion is being made. Hold the joint firmly together for 10 to 20 seconds without movement. If the spigot section backs out upon release, pull the joint apart and reapply another coat of cement and reassemble and hold until the joint does not back out upon release. Cold weather applications may require a longer holding time. A small bead of cement should appear around the lip of the bell if adequate cement has been applied. Wipe off excess bead after the joint has set.

3.7 Set Time: Handle the newly assembled joints carefully until the cement has gone through an adequate set time. Recommended set time is related to temperature of the joint follows:

- 30 minutes minimum at 60 to 100°F ((15 to 40°C)
- 1 hour minimum at 40 to 60°F (5 to 15°C)
- 2 hours minimum at 20 to 40°F (-5 to 5°C)
- 4 hours minimum at 0 to 20°F (-20 to -5C)

Note: Joint damage or loosening may occur up to 48 hours after assembly in temperatures below 40°F if the joints are severely stressed.
4.0 Expansion and Contraction Considerations

Thermal expansion and contraction of the PVC conduit system must be considered in all projects. PVC conduit expands or contracts at a rate of $3 \times 10^{-5}$ in./in./°F, or about $3/8$" per 100 feet per 10°F temperature change. The total change in length of the conduit run can be calculated by the following equation:

\[
\text{Length change, } L_c = C \times \text{(Conduit Length, inches)} \times (AT)
\]

Where:
- $C =$ Coefficient of Expansion $= 3 \times 10^{-5}$ in./in./°F
- $AT =$ Temperature change, °F

\[
L_c = (0.00003 \text{ in.}/\text{in.}/\text{°F}) \times (500 \text{ ft.}) \times (12 \text{ in./ft.}) \times (30°) = 5.4 \text{ inches}
\]

The most common effect of expansion is to create unsightly warpage or sagging in the conduit run although larger conduit may create damage to the terminations. Contraction is usually more damaging than expansion as it can create joint separation or pullouts at the termination. Design consideration must be given to both conditions.

For underground installations, expansion or contraction can usually be accommodated by “snaking” the conduit in the trench. It is desirable to allow the conduit run to normalize with the ground temperature before backfilling or making end connections such as at a manhole. Once the pipe in a trench has normalized and is backfilled, expansion and contraction is minimized due to the relatively constant earth temperature and the friction of the soil on the conduit.

In above ground installations, expansion/contraction can be accommodated by the use of change of direction fittings or by expansion joints. The conduit should be secured by hangers or straps which are tightened only to the point that slippage through the supports is possible. In long straight runs where bending or change of direction cannot be allowed and where the conduit ends must be securely terminated, expansion joints should be used (example: conduit suspended under a bridge). The number of expansion joints required can be calculated as follows:

1. Determine the total change in length, $L_c$, anticipated due to the maximum and minimum temperatures to when the conduit run will be exposed.

2. Use the following equation to determine the number of expansion joints required:

\[
\text{Eq.2) } N = \frac{L_c}{EA}
\]

Where:
- $N =$ number of expansion joints required
- $EA =$ expansion allowance in each expansion joint

Install the expansion joints at equal intervals along the run. The moveable section of the expansion joints must be set at the time of installation according to the installation temperature such that both expansion and contraction may be accommodated. Refer to the drawing shown below.