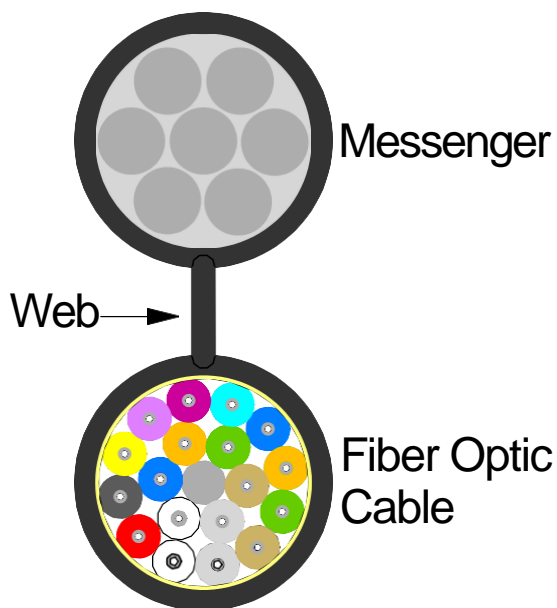


Figure 8 Installation Instructions

A figure 8 fiber optic cable design incorporates a steel or dielectric messenger into the fiber optic cable thus, eliminating the need to lash a fiber optic cable to a messenger. A figure 8 fiber optic cable consists of three components: the messenger, the webbing, and the fiber optic cable.



A figure 8 messenger cable has several advantages. Installation material cost may be reduced by eliminating the need to purchase a separate messenger wire and lashing wire. The labor cost can be greatly reduced in that there is only one installation job, installing the figure 8 cable. This compares with two installation jobs required when first the messenger must be installed, and then the cable installed by lashing it to the messenger. Typically, the overall cost of the installation may be reduced by as much as 40 %.

The OCC figure 8 cables are also uniquely available in an all dielectric configuration. This may eliminate issues of use near other cables or reduce the possibility of lightning strikes in high lightening areas.

Installation Precautions

Some precautions to installing figure 8 cables include the following:

- Cables installed near high voltage lines should be grounded if they contain conductive elements
- Follow the National Electrical Safety Code (NESC) for all installations
- Cables that contain a corrugated steel tape should be grounded
- Steel messengers should be grounded
- Maintain proper clearances between the fiber optic cable and the power cables
- Make allowances for sag
- The cable should be kept on one side of the poles (avoid zigzagging from one side of the pole to the other)
- Avoid twisting of the cable
- Always pull cable by the steel or dielectric messenger
- Maintain the minimum bending radius (MBR). The minimum bending radius for Optical Cable Corporation's figure 8 cables are as follows:
 - o Short Term Tensile Loading
 - 20XOD (fiber optic cable outside diameter)
 - o Long Term Tensile Loading
 - 10XOD (fiber optic cable outside diameter)

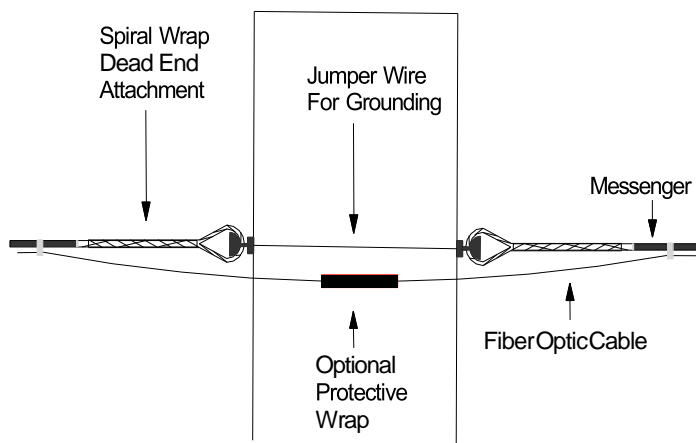
Hardware

Dead Ends

Dead ends maintain the tension in the cable. A typical dead end consists of spirally formed high strength steel wires which are installed to the bare messenger wire of the figure 8 cable.

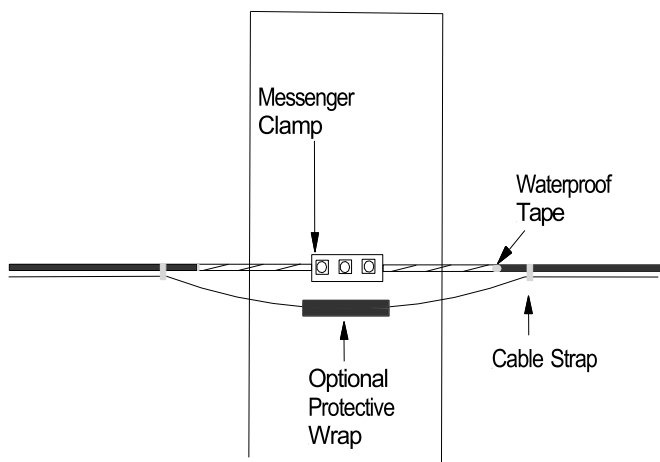
Another type of dead end is a strandwise. This type of dead end grips the messenger by using a compression sleeve when installed on the messenger.

Installation – Figure 8 Guidelines Excerpt from Optical Cable Corporation's *Installation Guide*



Tangent Support Clamps

Tangent support clamps are used to support the figure 8 cable where limited tension is applied to the figure 8 cable. Various types of tangent support clamps, typically 3-bolt designs, are available such as Type C, Corner Suspension Clamps, etc. Please consult the tangent support clamp manufacturer for pull tolerances, sizes, and angle departure.



J Hooks

J Hooks can be used to temporarily hold the cable on all poles during the installation until a dead end pole is reached.

Installation

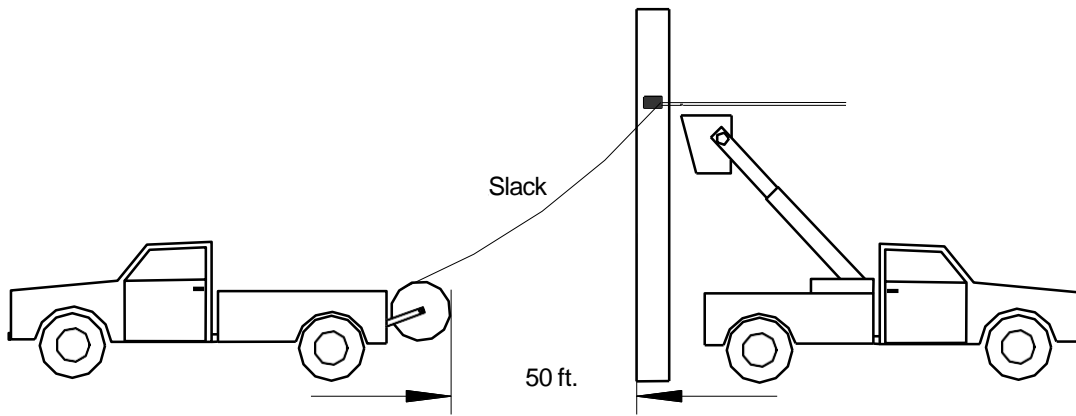
There are two basic types of installation techniques; moving reel method and stationary reel method.

Moving Reel Method

The moving reel method is best used when there are no obstacles between the cable reel and the aerial section of placement. Also, a clear path alongside the poles is needed for the reel trailer and trucks. This method of installation is typically less costly than other methods due to the fact that there is less hardware involved during the installation.

The cable is payed off a moving reel trailer, or truck, while driving along the route of the poles. At each pole location, the reel must be kept at least 50 feet down the line from the pole while the cable is lifted into place on the pole. J Hooks are used to temporarily hold the cable in place on each pole until a dead end pole is reached. Once a dead end pole is reached, the messenger is tensioned and the messenger is terminated with dead end hardware and attached to the pole. Once the cable has been secured with the dead end hardware, the cable between the dead ends should be securely fastened to the poles by removing the J Hooks and attaching the proper tangent support hardware.

Installation – Figure 8 Guidelines Excerpt from Optical Cable Corporation’s *Installation Guide*



Moving Reel Method

Stationary Reel Method

The stationary reel method is best used when there are obstacles along the planned cable route that do not allow a reel trailer and truck to drive through. This method is generally more costly than other methods.

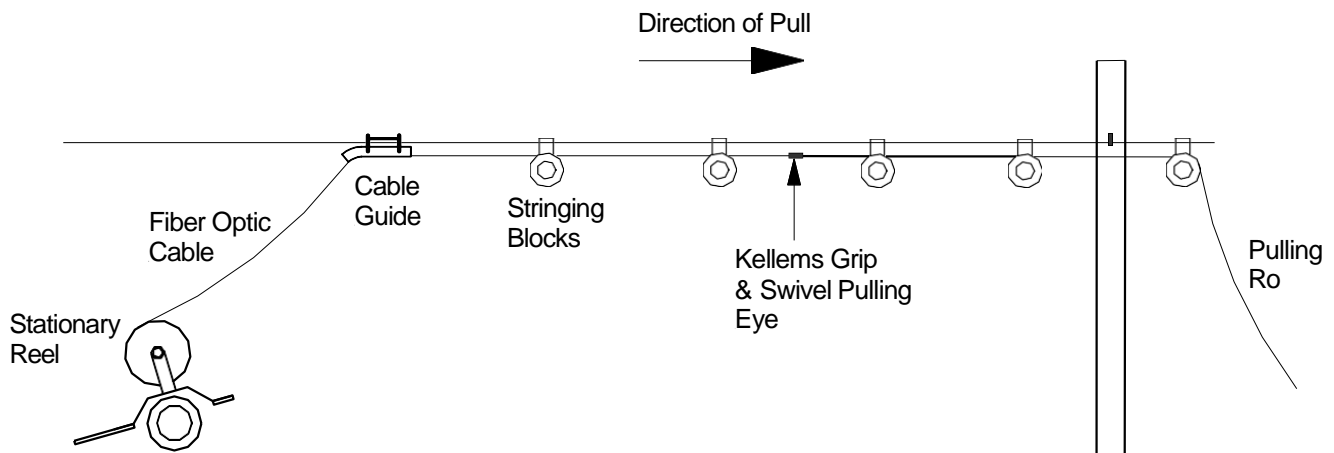
In the stationary reel method, the figure 8 cable is pulled into place using rope and stringing blocks placed at each pole along the route. The radius of the stringing blocks must meet the minimum bending radius (under installation load or short term load) of the cable.

During the pull of the cable onto the stringing blocks, Kellems pulling grips and a break-away swivel that is rated at the proper pulling tension of the cable should be used

to attach the pulling rope to the cable. Please refer to the Installation – General Guidelines of the Optical Cable Corporation Installation Guide.

Once the cable has been pulled into place, the messenger is tensioned and terminated with dead end hardware and attached to the pole at each dead end location along the route.

Once the cable has been secured with the dead end hardware, the cable between the dead ends should be securely fastened to the poles by removing the cable from the stringing blocks and attaching the proper tangent support hardware.



Installation – Figure 8 Guidelines Excerpt from Optical Cable Corporation's *Installation Guide*

Installation – Figure 8 Guidelines Excerpt from Optical Cable Corporation's *Installation Guide*

OCC-206-7

CONTROLLED DOCUMENT
Rev. A 8 April 2008

Aerial Lashing Instructions

Aerial installation can be performed by lashing a fiber optic cable designed for aerial lashing to an existing steel messenger wire. These fiber optic cables may be lashed to the steel messenger wire even if there is already another fiber optic cable attached.

Some precautions to aerial lashing include the following:

- Follow the National Electrical Safety Code (NEESC) for all installations
- Cables installed near high voltage lines should be grounded
- Cables that contain a corrugated steel tape should be grounded
- The steel messenger shall be grounded
- Maintain proper clearances between the fiber optic cable and the power cables
- Make allowances for changing sag of the steel messenger wire in various weather conditions. Steel messenger wire will expand and increase sag in warm weather.
- The steel messenger should be kept on one side of the poles (avoid zigzagging from one side of the pole to the other)
- Maintain proper tension with the lashing wire and avoid excessive tension.

There are two basic types of aerial lashing; moving reel method and stationary reel method.

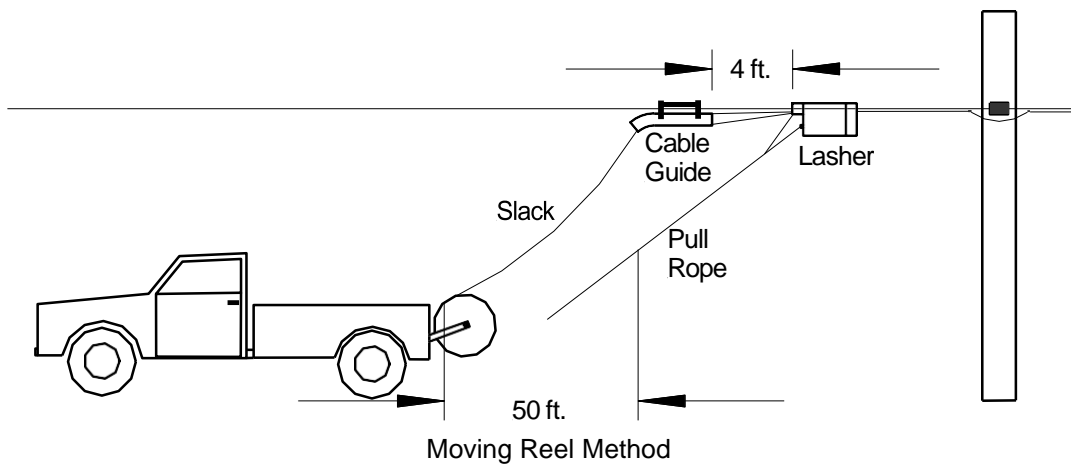
Moving Reel Method

The moving reel method is best used when there are no obstacles between the cable reel and the steel messenger. Also, a clear path along the pole line is needed for the reel trailer and truck. This method of lashing is typically less costly than other methods due to the fact that there is less hardware involved during the installation.

The reel trailer and truck are used to distribute the cable onto the steel messenger. A cable guide and lasher are used to secure the cable to the steel messenger. The lasher is pulled by hand along the length of route. The cable guide is used to help guide the cable ahead of the lasher. The cable guide should be kept 4 feet in front of the lasher by the use of stiff rod. The cable guide must have a smooth surface and meet the minimum bending radius of the cable.

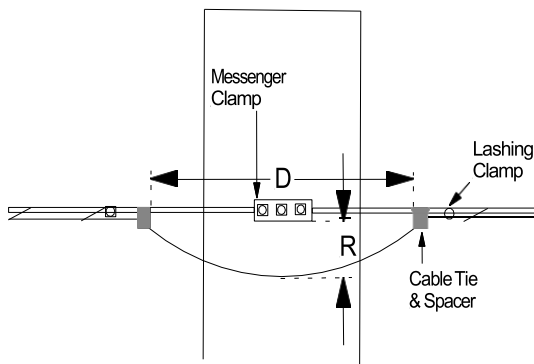
The cable reel must be kept at least 50 feet in front of the cable guide. While pulling the lasher by hand at a constant speed, a slight downward tension should be kept on the lasher. The cable should not be allowed to wrap around the steel messenger.

Each time a pole is reached, the pulling should stop. The lasher and cable guide should be disconnected and moved past the pole. The lashing wire should be terminated with a lashing clamp and the cable formed into an expansion loop. Once the lasher and cable guide are moved to the other side of the pole and the expansion loop is complete, the lashing operation should be continued.



An expansion loop is formed at each pole to allow for the expansion of the steel messenger. The steel messenger expands and contracts with temperature changes at much higher rates than fiber optic cables.

The expansion loop's size should be determined by the weather and messenger constraints. The length of D of the loop in the figure below should be greater than twice its depth R. The length D should also be greater than twice the cable's minimum bending radius.



Expansion Loop

Stationary Reel Method

The stationary reel method is best used when there are obstacles between the cable reel and the steel messenger or there is no clear path along side the pole line to allow a reel trailer and truck to drive through.

In the stationary reel method, the fiber optic cable is pulled into place underneath the steel messenger using stringing blocks. The cable is then lashed to the steel messenger.

During the pull of the cable onto the stringing blocks, Kellems pulling grips and a break-away swivel that is rated at the proper pulling tension of the cable should be used to attach the pulling rope to the cable. Please refer to the Installation – General Guidelines of the Optical Cable Corporation Installation Guide.

Cable blocks should be suspended beneath the steel messenger and are used to temporarily support the cable beneath the steel messenger until it can be lashed. The maximum spacing for the stringing blocks is 50 feet. Shorter distances are recommended. All stringing blocks should be placed on the steel messenger facing the same direction. The stringing blocks should be sized appropriately the size of cable being installed. Snatch blocks should be used on corner poles when the cable route changes directions.

A cable guide should be used to guide the cable onto the stringing block. The cable guide must have a smooth surface and meet the minimum bending radius of the cable.

Once the cable has been pulled onto the stringing blocks, the cable is ready to be lashed. The lasher should be pulled by hand along the length of route beginning at the far end of the route and then pulled towards the stationary reel. While pulling

the lasher by hand at a constant speed, a slight downward tension should be kept on the lasher. The cable should not be allowed to wrap around the steel messenger.

Each time a pole is reached, the pulling should stop. The stringing blocks are pushed ahead of the lasher as it moves down the cable route. When reaching a pole, the stringing blocks should be removed from the strand. The lasher should

then be disconnected and moved past the pole. The lashing wire should be terminated with a lashing clamp and the cable formed into an expansion loop. Once the lasher and cable guide are moved to the other side of the pole and the expansion loop is complete, the lashing operation should be continued (see expansion loop description under moving reel method).

