# RIGID ALUMINUM CONDUIT

## 1. Scope

This construction standard is intended to point out the special requirements necessary for proper installation of rigid aluminum conduit. For a complete presentation of conduit practice, see American Iron and Steel Institute Manual, "Steel Electrical Raceways."

## 2. Cutting and Reaming

2.1 Sizes smaller than 1-1/4" should be cut with a hacksaw to avoid reducing the diameter. Larger sizes can be cut with conventional pipe equipment.

2.2 All ends of conduit shall be reamed to remove rough edges.

## 3. Threading

3.1 *Dies.* Use sharp dies reserved for threading aluminum conduit only. A tangent die with a 30o rake is recommended. This special rake may be specified when ordering dies, at no extra cost. See Figure 1.

3.2 *Coolant.* A mixture of half kerosene and half lard oil is ideal; however, any of the sulfur-base cutting oils are acceptable.

3.3 *Threads.* Conduit gaps inside of couplings are necessary in order to avoid butting. The taper of the threads is designed to make the last three threads the electrical connection. See Figure 2. Properly threaded conduit should be easily joined by hand, except for final tightening for the purpose of seal and electrical connection, which should be obtained by the application of approximately an additional half turn.

## 4. Bending

Aluminum conduit can be bent with the same equipment as used for steel conduit. In the 1/2", 3/4", and 1" sizes, aluminum conduit may be bent with the conventional hickeys, but a more uniform bend will result if EMT benders are used one size larger than the aluminum conduit that is to be bent. Thus, 1/2" conduit will require a 3/4" EMT bender. Regular conduit hand or hydraulic benders are used for larger sizes.

## 5. Installation

5.1 *Wrench Damage.* To avoid damage to aluminum, tighten only enough to meet mechanical and electrical requirements. A strap wrench is preferred to a pipe wrench, which may gouge the aluminum.

5.2 *Thread Lubrication.* An anti-seize compound shall always be used on the threads. A corrosion inhibiting and lubricating compound, Stock No. 726180, shall be used for this purpose.

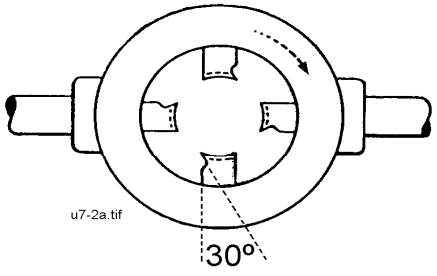


**Figure 1.**

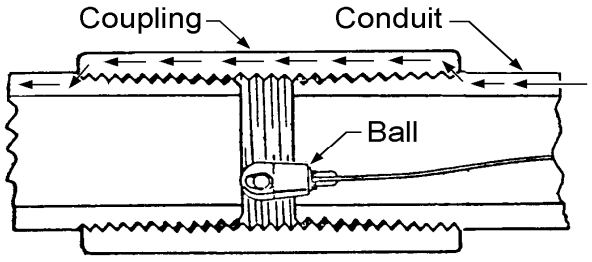


**Figure 2.**

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|---|---|---|---|
| Jim S. Horn | Charles L. Shaffer | John C. Skinner | Betty Robinson |

**5. Installation,** continued

5.3 *Thermal Expansion.* Aluminum has about double the thermal expansion of steel conduit. On long runs, 100' or more, this expansion should be provided for where the conduit is exposed to considerable heating. If adequate movement cannot be provided for in the design, an expansion joint should be installed. These expansion joints should have a bonding strap across them to assure electrical continuity. It is necessary to leave slack in the cable in each junction box to allow for this expansion. See Figure 3.

5.4 *Joining Aluminum to Steel Conduit.* When joining aluminum to steel conduit, use aluminum couplings rather than steel. Apply the thread lubricant liberally to the male threads before they are screwed into the coupling. This prevents the lubricant from entering the conduit or subsequently contacting the wire insulation.

5.5 *Pulling of Wires and Cables.* Standard methods are employed for pulling, except a ball should be attached to avoid gouging the aluminum. See Figure 2.

5.6 *Attachment to Weather-Exposed or Wet Surfaces.* Aluminum in contact with damp masonry or wood is subject to corrosion, and should be held out from the surface by the use of a galvanized spacer. See Figure 4.

5.7 *Fittings.* Aluminum conduit fittings are preferred, but aluminum conduit is compatible with galvanized steel. Care should be taken to keep aluminum exposed to wet conditions from coming in direct contact with ungalvanized steel.

5.8 *Support Spacing.* Support spacing can be greater due to the lighter weight of aluminum conduit. Approximately half as many supports need to be used on an aluminum conduit installation as would be necessary on a steel conduit installation.

5.9 *Aluminum conduit shall not be installed underground or encased in concrete.*

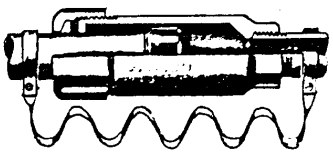
5.10 *Copper in Contact with Aluminum.* Copper should not be allowed to come in contact with aluminum conduit or fittings. Bare neutrals should be electrical grade aluminum wire.

**6. Engineering Considerations**

Since aluminum is nonmagnetic, it has two advantages which become significant in high current, large conductor installations.

6.1 *Separation of Phases.* When more than one conductor per phase is needed, all the conductors of one phase may be run in the same conduit without regard to balanced polyphase current. However, Seattle City Light practice is not to do this.

6.2 *Voltage Drop.* In steel conduit, there is a voltage drop in conductors due to the magnetic effect of the conduit. In aluminum conduit, only the conductor drop need be considered. Therefore, in some high-current applications, where the conductor size is determined by allowable voltage drop, the use of aluminum conduit instead of steel may permit a reduction in the conductor size, and consequently in the conduit size. For a complete discussion of these engineering considerations, see AIEE Paper No. CP-59-769, "The Use of Aluminum Conduit in Industry."



Expansion Joint and Bonding Strap

**Figure 3.**

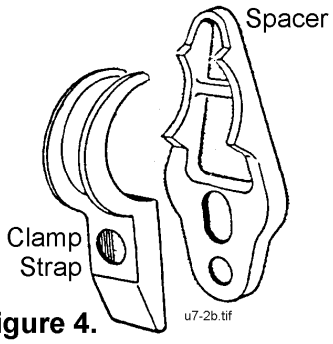



**Figure 4.**

**Spacer**
Stock No. 713452
thru 713456

**Clamp Strap**
Stock No. 713443E
thru 713451