

John Wright



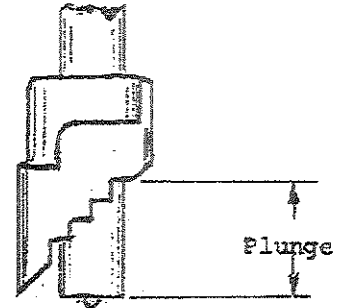
NELSON STUD WELDING

FERRULE SPECIFICATIONS: Special Ferrule for Welding at an Angle to a Base Plate

Studs are often welded at an angle on embedment plates. Special ferrules are needed to prevent binding in the neck of the ferrule, and to achieve consistent results.

45° welding requires the use of stops to prevent the ferrules from moving during the weld cycle. Heavy-duty guns need to be used to get sufficient gun travel.

The ferrule grip shown below for the 3/8" studs at 23° angles is not a split grip. The ferrule grips for 3/8" and 1/2" studs at 45° angles are special split grips. The use of split ferrule grips is desirable when welding D21 studs at angles.



Stud Diameter A	Angle	Ferrule Neck Diameter B	Grip	Ferrule Part Number
3/8	23°	0.535	501008006	101040010
3/8	45°	0.650	501009006	101040007
1/2	45°	0.785	501009008	101040008

Visit our website www.NelsonStudWelding.com for a list of our standard stock products.

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Application Information

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NELSON
STUD WELDING

Stud: D2L's - 3/8" and 1/2"

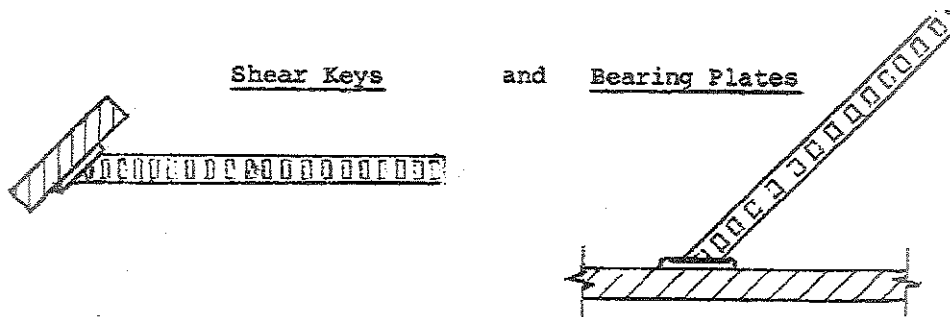
Date: Nov. 22, 1985

Use: AT 45° ON INSERTS

APPLICATION: 3/8" and 1/2" D2L studs are welded at 45° angle onto bearing plates, shear keys and other embedment plates that will be cast in concrete. The D2L studs are often specified at a 45° angle to the base material since they have design and performance advantages over studs welded perpendicular to the base plate even if the studs are bent after welding. The cost advantage of being able to weld the studs at 45° to eliminate the need for a bending operation is obvious.

DIAGRAM:

D2L's at 45° Angle for



MARKET:

The market for D2L's welded at 45° angles includes both poured-in-place construction site applications and all precast/prestress plants. Major usage is in the manufacture of single tee, double tee, and other concrete beams where the D2L's welded at 45° are used on bearing plates at the ends of the beam and on the shear keys along the edges of the beams. The manufacturers of hollow core sections can also use short D2L's welded at 45° on connection insert plates.

WEAKNESS OF COMPETITION:

Hand welding of rebar has the disadvantages of being slow and difficult to fixture. It is difficult to get adequate weld strength unless the rebar has a short 90° bent leg to weld to the base plate. Both sides of the bent leg must usually be welded to get good strength. The chemistry of rebar material is commonly so high that the resulting welds can be brittle and any welded rebar connection is suspect. The Prestressed Concrete Institute (PCI), American Concrete Institute (ACI), and A.W.S. place severe restrictions on hand welding reinforcing bar due to the brittleness that can result.

BENEFITS OF
STUD WELDING:

Stud welded D2L's welded straight or at 45° have a reliability advantage over welded rebar since we maintain close control of the steel chemistry to assure weldability and avoid excess weld zone hardness. Welding D2L's at 45° to the base material results in a straight line connection between the steel insert and the concrete. This avoids the chance of premature failure or reduced load capacity that could result from straightening of the bends with hand welded rebar.

Speed of application weld consistency and reliability with stud welding provide savings in time, skill level, and inspection requirements.

Nelson D2L studs conform to ASTM A-496 with respect to both physical strength and surface deformations. Chemically, they are within the ASTM A-108 Grades C-1010 through C-1020 as allowed by AWS D1.1.

STUDS:

Spec 24 of the In-Stock Stud Catalog shows the standard lengths of 3/8" and 1/2" D2L's. Other lengths are available on special order.

FERRULES:

The special ferrules are the key to obtaining good weld quality when welding at a 45° angle. The part numbers for these ferrules are #100-104-007 for 3/8" and #100-104-008 for 1/2".

There is no additive to the net price of 3/8" or 1/2" D2L's for the 45° ferrules but they must be specified on the stud order.

ACCESSORIES:

	<u>3/8" Stud Dia.</u>	<u>1/2" Stud Dia.</u>
Chuck	500-001-011	500-001-014
Foot	502-002-001	502-002-002
Grip	501-009-006	501-009-008
Ferrule	100-104-007	100-104-008
Foot	<i>Small Split 502-002-001</i>	<i>Medium Split 502-002-002</i>

Split feet and ferrule grips are used to facilitate the loading and stripping off the longer D2L studs. Bellmouth chucks can be used to speed the loading of studs. The 3/8" Bellmouth Chuck is #500-002-012. The 1/2" Bellmouth Chuck is #500-002-005.

The use of the three leg adaptor plate with a tubular leg extension assembly from the #512-193-400 series drawing is recommended when welding any D2L studs over 12" long

to prevent flexing of the legs as the gun lifts and plunges. Leg flexing can be a problem with any long studs even when welding perpendicular to the base material. Flexing of the gun legs causes variations in the lift and arc length. Without the leg extension assembly, the degree of leg flexing is determined by how much pressure the operator applies to the gun handle and the length of the legs extending out of the gun body. The rigid 3-leg mounting and the tubular extension eliminate flexing problems.

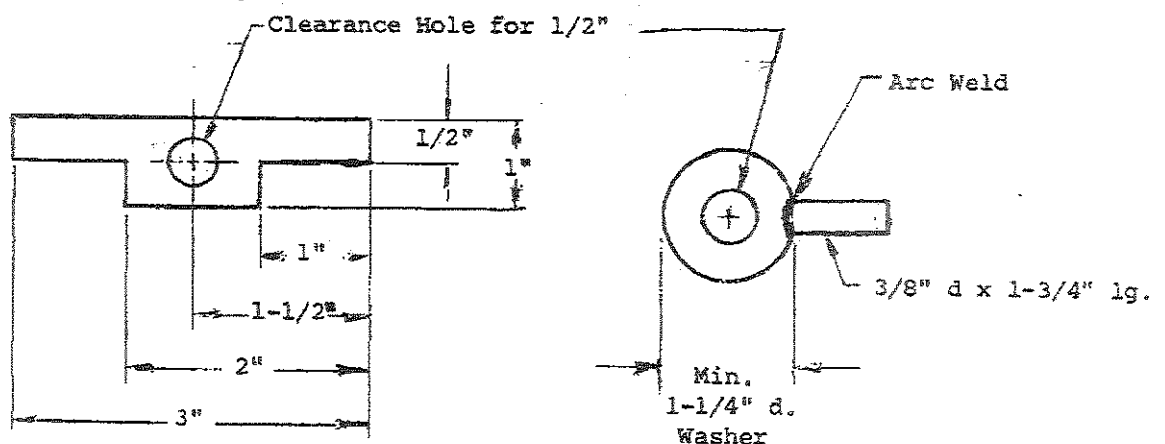
CAUTION:

Only Heavy Duty guns can be used to weld D2L's at 45°.

The long plunge setting and the burn-off needed to get to a full cross section at a 45° angle exceed the gun travel or stroke of universal or standard guns and they have no travel left to lift the stud during the weld cycle.

SPECIAL ACCESSORY:

A special manual cocking lever is needed to take up the plunge travel when welding D2L's at 45°. Attempting to take up the plunge for a 45° weld in the normal manner will only result in broken ferrules and partial compression of the gun mainspring which will cause dead short welds the gun attempts to lift the stud during the weld cycle. The long plunge travel combined with the friction of the stud going through the ferrule at a 45° makes it mandatory that the plunge travel be manually taken up. This is best accomplished by installing a lever on the 1/2-20 threaded extension onto which the chuck adaptor mounts. The lever clamped between the threaded extension and the chuck adaptor allows the weld operator to hold the gun in one hand and compress the gun mainspring with the other hand until he gets the stud and ferrule to the weld location. At that time, he releases the lever and triggers the weld cycle.

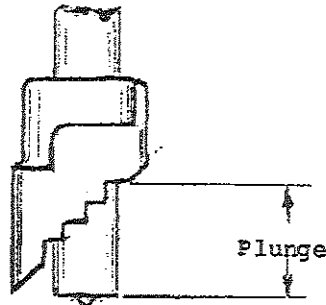
Typical Levers:

Material 3/16" or 1/4" Thick

WELD
SETTINGS:

	<u>3/8" Stud Dia.</u>	<u>1/2" Stud Dia.</u>
Lift	1/16"	1/16"
Plunge	.406"	1/2"
Amperage	700	1050
Time	.6 seconds	.75 seconds
Free Travel	1/16"	1/8"

The plunge setting is measured along the more exposed side of the stud opposite the "long" side of the ferrule.

MEASURING PLUNGESPECIAL
FIXTURING:

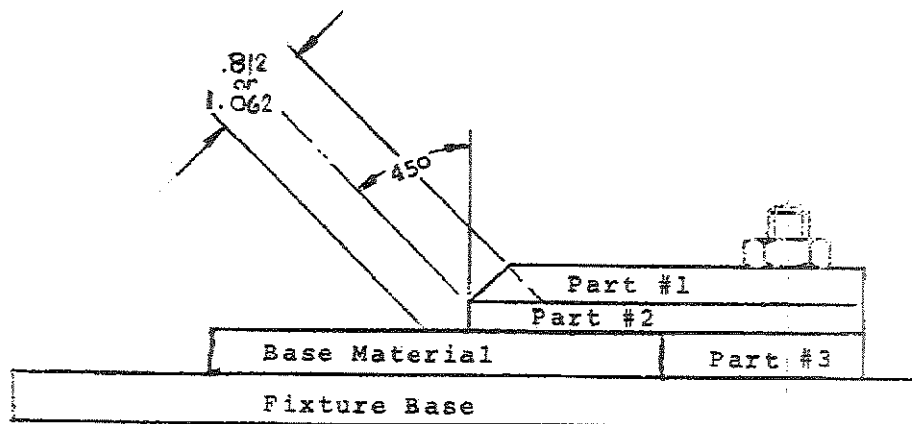
In order to keep the stud, ferrule, and base plate from sliding during the weld, a special fixture stop block is needed. These fixture stop blocks can be a simple 45° angled stop strip or a machined block with a pocket to give specific stud locations. Several of these stops may be used on fixtures to weld inserts with more than one stud on them. The stop blocks can be bolted to the fixture or welded in place depending on the preference of the customer. Generally, the customers fabricate the fixture to suit their own particular requirements and the type of plates they produce for their product. We have seen considerable variety with respect to base material, thickness, length, width, and stud spacings.

Some accounts have built swivel fixtures to turn parts so that the 45° welded D2L's point in opposite directions. We cannot satisfy the requirements of all customers but we have found that the fixture illustrated on the final page explains the concept and can be adapted to meet most insert plate requirements.

BASE MATERIAL: As with all applications that may involve hot rolled steel as the base material, judgment and care are required to insure good weld results. Excess mill scale and rust can cause problems with arc initiation, grounding, and weld contamination.

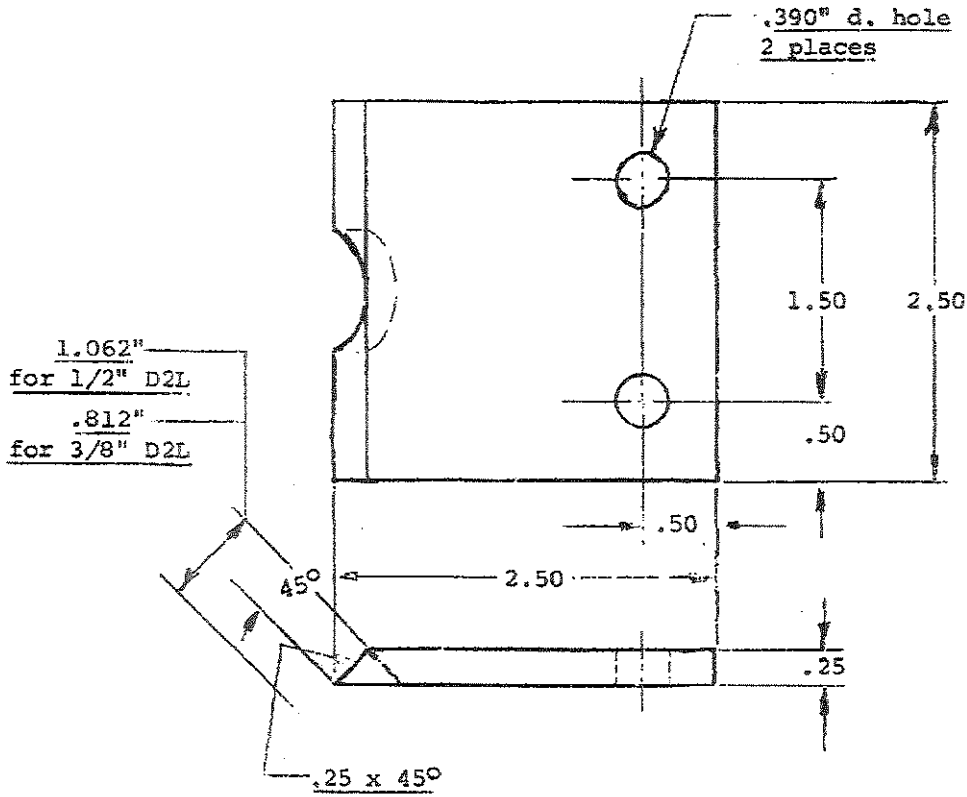
ADDITIONAL COMMENTS: The same ferrules and accessories used to weld 3/8" and 1/2" D2L's at 45° can be used to weld 3/8" and 1/2" NBL's or H4L's at 45° if the stud length is 3" or longer.

TEMPLATE BLOCK ASSEMBLY
FOR WELDING D2L's @ 45° ANGLE

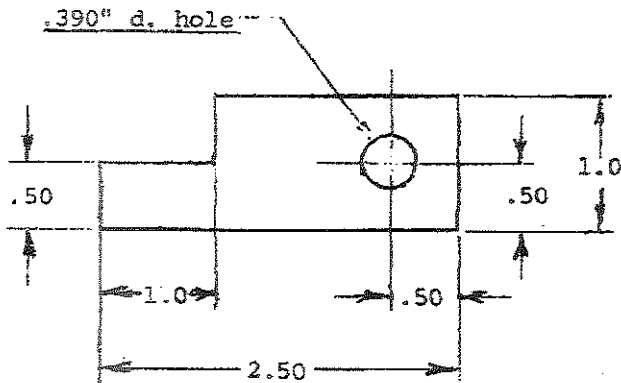


NOTE: Part #3 should be equal to the thickness of the insert plate being welded.

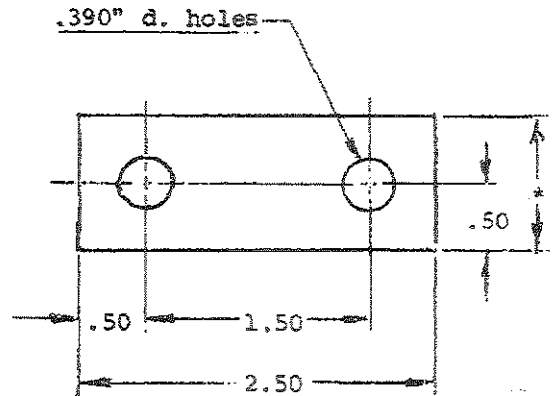
PART #1 TEMPLATE BLOCK



PART #2 - 3/16" THICK SPACERS - 2 NEEDED



PART #3 - STOP PLATE
SAME THICKNESS AS BASE MATERIAL



* Determines the spacing of the stud from the edge of the insert plate