

$$t = \frac{s}{340} \sqrt{L - 35} + 3 \text{ mm}$$

where:

t = thickness in mm

s = frame spacing in mm

### L.15.3 Side Shell Plating

#### L.15.3.1 General

The side shell plating is not to be less in thickness than that obtained from the following equations:

$$(a) \quad t = \frac{s}{645} \sqrt{(L - 15.2) \left( \frac{d}{D} \right)} + 2.5 \text{ mm}$$

$$(b) \quad t = \frac{s \sqrt{h}}{250} + 2.50 \text{ mm}$$

where:

t = thickness in mm

s = spacing of transverse frames or longitudinals in mm

L = length of vessel as defined in sub-clause A.4.8 or 30 metres, whichever is the greater.

h = distance from the lower edge of the plate to the freeboard deck at side in m.

#### L.15.3.2 Vessels Subject to Impact

For tugs, supply vessels and other vessels subject to impact loading during routine operations it is recommended that a side shell 25% greater in thickness than that obtained from the equation in L.15.3.1 be provided.

#### L.15.3.3 Forecastle and Poop Side Plating

The minimum thickness of the side shell plating given by the equation in L.15.3.1 in way of the forecastle and poop may be reduced by the amount given in (a) below, but in no case is the forecastle or poop plating to be less than that given by the equations in (b).

$$(a) \quad t_{\text{reduction}} = 2.667 \left( \frac{d}{D} - 0.65 \right) + 0.50 \text{ mm}$$

where:

$t_{\text{reduction}}$  = allowable reduction of side shell plating in way of forecastle or poop

$$(b) \quad t = 0.006 s \sqrt{\frac{d}{D}} + 2.5 \text{ mm}$$

where:

t = thickness in mm

s = spacing of frames in mm

Where the strength deck at the ends is above the freeboard deck, the thickness of the side plating above the freeboard deck may be reduced to the thickness given for forecastle and poop sides at the forward and after ends respectively.

### L.15.4 Compensation

Compensation is to be made for large openings in the shell plating where required to maintain the longitudinal and transverse strength of the hull. All openings are to have wellrounded corners. Cargo and gangway openings are to be kept well clear of other discontinuities in the bull girder. Around hawse pipes, thick plating or doublers of sufficient breadth to prevent damage from the flukes of stockless anchors, are to be fitted. Each sidescuttle where fitted is to have its upper edge a minimum of two times its diameter below the edge of the deck above it.

### L.15.5 Breaks

The sideplating of superstructures, including forecastles and poops, is to extend beyond the end of the superstructure in such a fashion as to provide a long gradual taper.

Gangways, large freeing ports, and other sizeable openings in the shell or bulwarks are to be kept clear of the breaks. Any holes that must unavoidably be cut in the shell adjacent to the breaks are to be kept as small as possible and are to be circular or oval in form.

**L.16 Decks**

L.16.1 General

The thickness of deck plating is not to be less than required for the purposes of longitudinal hull girder strength but in any case not less than 0.01 mm per mm of frame spacing nor less than required by this clause.

L.16.2 Deck Plating

The thickness of plating on each deck is to be not less than obtained from the following equation:

$$t = \frac{s \sqrt{h}}{250} + 2.50 \text{ mm}$$

where:

t = thickness in mm

s = stiffener spacing in mm

h = height of load in metres, determined as follows:

1. For a dock or portion of dock forming a tank top, the greater of the following:
  - (a) two thirds of the distance from the tank top to the top of the overflow
  - (b) two thirds of the distance from the tank top to the bulkhead deck or freeboard deck whichever is applicable.
2. For a deck on which cargo or stores are carried, the height is the tweendeck height at side where the cargo mass is less than or equal to 720 kg/m<sup>3</sup>. Where the cargo mass exceeds 720 kg/m<sup>3</sup>, it should be adjusted correspondingly.
3. For an exposed deck on which cargo is carried, 3.65 metres. Where deck cargoes in excess of 2640 kg/m<sup>2</sup> are to be carried, the head is to be increased in proportion to the added loads which will be imposed on the structure.
4. Elsewhere the height should be obtained as appropriate from the following equation:
  - (a) exposed freeboard deck with no deck below h = 0.02L + 0.75 metres
  - (b) exposed freeboard deck having a dock below, forecastle deck, superstructure deck, forward of the amidships 0.5L
 
$$h = 0.02L + 0.50 \text{ metres}$$
  - (c) freeboard deck within a superstructure, any deck below freeboard deck, superstructure deck between 0.25L forward of and 0.20L aft of amidships
 
$$h = 0.01L + 0.60 \text{ metres}$$
  - (d) all other locations,
 
$$h = 0.01L + 0.30 \text{ metres.}$$

L.16.3 Additional Requirements for Vehicle Deck Strengthening

L.16.3.1 Wheel Loads

- (a) Car Deck - Single wheel at each end of axle: P = 0.5 times the axle load in tonnes. Double wheels at each end of axle: P = 0.4 times the axle load in tonnes.
- (b) Fork lift trucks with rubber tyres: with single front wheels:

$$P = 1.2 \frac{V + T}{n_1}$$

where:

V = weight of truck in tonnes

T = load capacity of truck in tonnes

$n_1$  = number of single front wheels

With double front wheels (dual wheels)

$$P = \frac{V + T}{1.2 n_2}$$

where:

V and T are as above

$n_2$  = number of double wheels

(c) Pallet trucks with steel tyres:

P = load capacity of truck in tonnes. The specified strengthening for pallets is primarily to be applied in areas where pallet trucks are frequently used. Outside those areas the plate thickness may be gradually reduced to normal in those areas in which trucks seldom or never operate.

#### L.16.3.2 Deck or Inner Bottom Plating

(a) In decks or inner bottoms exposed to loading from vehicles (cars, trucks etc.) the plate thickness is not to be less than that obtained from the following equations:

$$t = k \sqrt{P (1 - 0.1) \sqrt{P}} + 1 \text{ mm}$$

where:

P = wheel load in tonnes

k = 5.2 for wheels with pneumatic rubber tyres

k = 6.0 for wheels with solid rubber tyres

k = 7.8 for wheels with steel tyres

The equation for plate thickness is valid for wheel loads up to 16 tonnes. For greater wheel loads the thickness will be specially considered by the Authority.

(b) Where the transverse or longitudinal deck beam spacing differs from 700 mm, the plate thickness may be corrected by 6 per cent for rubber wheels and 3 per cent for steel wheels for every 100 mm difference.

(c) The above equation is based on the assumption that the wheels are of normal diameter (300-1000 mm for pneumatic tyres, 100-200 mm for solid tyres and 75-100 mm for steel wheels). If the diameters differ considerably from these figures, the thickness will be specially considered by the Authority.

(d) For extreme beam or longitudinal spacing, wheel dimensions, and other stiffening arrangements, the scantlings will be specially considered by the Authority.

#### L.16.3.3 Deck Beams and Longitudinals

(a) Vehicle decks may have transverse or longitudinal beams. Transverse beams are to have a minimum section modulus not less than that obtained from the following equations:

$$(i) \quad Z = 5.2 Pl \left( 1 + \frac{s}{0.4} \right) \text{ cm}^3 \text{ where } l < 2.5\text{m}$$

$$(ii) \quad Z = (121 - 17) P \left( 1 + \frac{s}{0.4} \right) \text{ cm}^3 \text{ where } l \geq 2.5\text{m}$$

where:

P = wheel load in tonnes for L 16.3.1

l = unsupported span of beam in metres

s = beam spacing in metres

- (b) Beams in decks where loading or unloading is carried out by forklift trucks with rubber tyres are to have a section modulus not less than that obtained by the following equations:

$$Z = 6.5 P (1 - 0.9) \left( 1 + \frac{s}{0.4} \right) \text{ cm}^3$$

where:

P = wheel load in tonnes for L 16.3.1

l = span of beams in metres (for beams which are not supported by girders or pillars the span is to be increased by 10 per cent)

s = beam spacing in metres

## L.17 Superstructures and Deckhouses

### L.17.1 Superstructures

#### L.17.1.1 Side Plating

The thickness of superstructure side plating is to be not less than:

$$t = \frac{s}{645} \sqrt{(L - 15.0) \frac{d}{D}} + 2.5 \text{ mm}$$

where:

t = thickness in mm

s = spacing of transverse frames or longitudinals in mm  
= 500 + 0.83L mm

L = length of vessel as defined in A.4.8 or 30.0 m whichever is the greater

d = draft for scantlings as defined in A.4.6

D = depth of vessel in metres as defined in A.4.5

The thickness should not in any case be less than:

$$t = 0.05L + 2.80 \text{ mm}$$

where:

t = thickness in mm with a maximum value of 7.5 mm.

#### L.17.1.2 Frames

Bulkheads, partial bulkheads, or web frames are to be fitted over main bulkheads and elsewhere as necessary to give effective transverse rigidity to the structure.

#### L.17.1.3 End Bulkheads

The thickness of plating required in superstructure end-bulkheads on the freeboard deck is to be not less than obtained from the following equation:

$$t = 0.05L + C \text{ mm}$$

where:

t = bulkhead plating thickness in mm

C = 5.40 for exposed front ends of poops and bridges

= 3.80 for partially protected front ends of poops

= 2.80 for exposed after ends of bridges and forecastles

Where the spacings of stiffeners is greater (or less) than 760 mm, the thickness of the side and end plating is to be increased (or reduced) at the rate of 0.5 mm for each 100 mm difference in spacing. The maximum reduction permitted is 1.50 mm.

#### L.17.1.4 Stiffeners

The section modulus Z of each bulkhead stiffener in association with the plating to which it is attached is to be not less than:

$$Z = 7.9 \text{ scl}^2 \text{ cm}^3$$

where:

s = stiffener spacing in metres

l = moulded height of the superstructure in metres, or in the case of horizontal stiffeners, web spacing in metres

c = 0.10L for exposed front ends of poops and bridges

= 0.023L for superstructure sides and partially protected front ends of poops

= 0.015L for exposed after ends of bridges and forecastles

Stiffeners in the front bulkheads of poops and bridges are to be attached to the deck plating at their upper and lower ends by welding all round.

L.17.1.5 Superstructures above the first tier are to be treated as deckhouses.

L.17.2 Deckhouses

L.17.2.1 Definition

A deckhouse is an enclosed structure above the freeboard deck having side plating set inboard of the hull's side shell plating by more than 4% of the breadth B of the vessel.

L.17.2.2 Scantlings

Deckhouses' side and after bulkhead plating and stiffeners are to have scantlings equal to the requirements for after bulkheads of bridge and forecastle superstructures.

Deckhouses' front plating and stiffeners are to have scantlings equal to the requirements for partially protected poop front bulkheads. Stiffeners on deck houses are to be attached in the same manner as stiffeners on superstructure bulkheads.

Bulkheads, partial bulkheads, or deep webs are to be fitted in long deckhouses to provide resistance to racking.

## **L.18 Protection of Deck Openings**

L.18.1 General

All openings in decks are to be framed to provide efficient support and attachment to the ends of the deck/beams.

L.18.2 Hatchway Coamings

L.18.2.1 Coaming Plates

Coaming plates are not to be less in thickness than that obtained from the following equation:

$$t = 0.05L + 5 \text{ mm}$$

where:

t = thickness in mm.

The thickness need not exceed the thickness of the deck plating where the length or breadth of the hatchway do not exceed 30 per cent of the beam of the vessel.

L.18.2.2 Coaming Stiffeners

Horizontal stiffeners are to be fitted on coamings 450 mm or greater in height. The breadth of the stiffeners is not to be less than that obtained from the following equation:

$$b = 1.67L + 50 \text{ mm}$$

where:

b = breadth in mm.

The thickness is not to be less than that of the coaming plate.

Efficient brackets or stays are to be fitted from the stiffener to the deck at intervals of not more than 3 metres. Where exposed coamings; are 760 mm or more in height, the arrangement of the stiffeners

and brackets or stays is to provide equivalent support. Where end coamings are protected the arrangement of the stiffeners and brackets or stays may be modified

L.18.3 Hatchways Within Open Superstructures

Hatchways within open superstructures are to be considered as exposed.

L.18.4 Hatchways Within Deckhouses

Hatchways within deckhouses are to have coamings and closing arrangements appropriate to the protection afforded by the deckhouse having regard to its construction and the means provided for closing all openings into the house.

L.18.5 Machinery Casings

L.18.5.1 Exposed Casings on Freeboard or Raised Quarter Decks

Exposed casings on freeboard or raised quarter decks are to have plating not less in thickness than that obtained from the following equation:

$$t = 0.0164L + 6 \text{ mm}$$

where:

t = thickness in mm.

Stiffeners are to be at least as effective as those determined from the following equation:

$$Z = 7.9 \text{ chsl}^2 \text{ cm}^3$$

where:

Z = section modulus of each stiffener in association with the plating to which it is attached

c = 0.29 for a stiffener with effective brackets at both ends of its span

= 0.38 for a stiffener with an effective bracket at one end and a lug connection or horizontal girder at the other end

= 0.46 for a stiffener with lug connections at both ends or a lug connection at one end and a horizontal girder at the other end

= 0.58 for a stiffener between horizontal girders or for a stiffener with no end attachments

h = 0.51 metres

l = tween deck height in metres

s = spacing of stiffeners in metres.

L.18.5.2 Exposed Casings on Superstructure Decks

Exposed casings on superstructure decks are to have plating not less in thickness than that obtained from the following equation:

$$t = 0.033L + 3.5 \text{ mm where:}$$

t = thickness in mm.

Stiffeners in association with the plating to which they are attached are to have section moduli Z as obtained from the following equation:

$$Z = 7.9\text{cshl}^2 \text{ cm}^3$$

where:

c = 0.25

s = spacing of stiffeners in metres

h = 0.51 metres

l = length between supports of the stiffeners in metres

L.18.5.3 Casings within Open Superstructures

Casings within open superstructures are to be of similar scantlings to those obtained from L.18.5.2.

L.18.5.4 Casings Within Enclosed Superstructures, Deckhouses or Below Freeboard Decks

Casings within enclosed superstructures or in decks below the freeboard deck where cargo is carried are to have plating not less in thickness than that obtained from the following equation:

$t = 0.0164L + 3.5$  mm where:

t = thickness in mm.

Stiffeners are to be fitted in line with the beams and are to have section moduli Z as required in L.18.5.2 except that the value of coefficient c in that formula should be 0.14 instead of 0.25 and h is the tween deck height.

## **L.19 Cargo, Gangway or Fuelling Ports, Ventilation Coamings**

### **L.19.1 Cargo Gangway or Fuelling Ports**

#### **L.19.1.1 Construction**

Cargo, gangway or fuelling ports in the sides of vessels are to be strongly constructed and capable of being made watertight. Where frames are cut in way of such ports web frames are to be fitted on the sides of the openings and suitable arrangements made for the support of the beams above the openings.

Thick shell plates or doublers are to be fitted as required to compensate for the openings. The corners of the openings are to be well rounded.

Waterway angles and scuppers are to be provided on the decks in way of ports in cargo spaces below the freeboard deck or in cargo spaces within enclosed superstructures to prevent the spread of any leakage of water over the decks.

#### **L.19.1.2 Location**

The lower edges of cargo gangway or fuelling port openings are not to be below a line parallel to the freeboard deck at side having as its lowest point the designed load waterline or upper edge of the uppermost load line mark.

### **L.19.2 Ventilator Coamings**

Ventilators on exposed freeboard decks, superstructure decks or deckhouses are to have coamings of steel or equivalent material. The coaming plate thicknesses are to be obtained from the following equation:

$t = 0.01d + 5.5$  mm

where:

t = thickness of coaming in mm

d = diameter of ventilator in mm

In no case need the maximum coaming plate thickness be greater than the thickness of the deck surrounding the hatchway or 10 mm which ever is the less. The coamings are to be effectively secured to the deck.

## **L.20 Vessels Intended to Carry Oil in Bulk**

Scantlings for vessels intended to carry oil in bulk will be specially considered by the Authority.

## **L.21 Welding Practice**

### **L.21.1 Scope**

L.21.1.1 This clause applies to manual electric arc welding used in steel hull construction. Other modes of welding and alternative techniques may be considered upon submission of full details to the Authority.

L.21.1.2 Unless otherwise approved, welds shall be designed, prepared, assembled and completed in accordance with the requirements of this clause.

### **L.21.2 Welding Details To Be Used In Plans**

L.21.2.1 The plans submitted for approval shall clearly indicate the extent to which welding is proposed to be used in the principal parts of the structure.

L.21.2.2 The welding process as well as the details of the types of joints and the amount of welding are to be shown in the detail drawings or a separate welding specification submitted for the approval of the

Authority. Sequences shall be indicated in all cases. Any approved arrangements, sequences and procedures shall not be departed from without the prior agreement of the Authority.

L.21.3 Welding Personnel, Plant and Equipment

- L.21.3.1 Welding operators are to be proficient in the type of work on which they are engaged. When the quality of the work of a particular welder does not, in the opinion of the Surveyor, meet the requirements of this Sub-section, the Surveyor may require such welder to undergo tests to show that he is capable of welding satisfactorily. These tests may be the practical tests for the welding positions to be undertaken as specified in AS 1796 (Certification of welders and welding supervisors).

*(Amendment dated 1 October 2008)*

A sufficient number of skilled supervisors is to be provided to ensure effective control at all stages of assembly, and welding operations.

- L.21.3.2 The welding plant and appliances are to be suitable for the purpose intended and are to be maintained in an efficient condition.

L.21.4 Preparation, Assembly and Completion

- L.21.4.1 Structural arrangement shall be such as to permit easy access for welding operations and the use of downhand welding wherever possible.

- L.21.4.2 The preparation of plate edges is to be accurate and uniform. All joints are to be properly aligned and closed or adjusted before welding. Excessive force is not to be used in fairing and closing the work. Means are to be provided for holding the work in proper alignment without rigid restraint during welding operations.

- L.21.4.3 Tack welding should be kept to a minimum where used. The tack welds should be equal in quality to the finished welds. All defective tack welds should be cut out before completing the finished welds. Care should be taken when removing tack welds and temporary fillings used for assembly to ensure that the material of the hull is not damaged.

- L.21.4.4 The surfaces of all parts to be welded are to be clean, dry and free from rust, scale and grease. The surfaces and boundaries of each run of deposit are to be thoroughly cleaned and free from slag before the next run is applied. Before a scaling run is applied to the back of a weld, the original root run is to be cut back to sound metal. Welding is to proceed systematically, each welded joint being completed in proper sequence without undue interruption.

- L.21.4.5 All finished welds are to be sound, uniform and substantially free from slag inclusions, porosity, under cutting and other defects. Care is to be taken to ensure thorough penetration and fusion. Australian Standard AS 1554.1 (Structural steel welding – Welding of steel structures) may be used as a basis for good practice.

*(Amendment dated 1 October 2008)*

- L.21.4.6 Primer coatings of ordinary thickness, applied to plates over areas which will be subsequently welded, may be used, provided it is demonstrated that their use has no adverse effect on the production of satisfactory welds.

L.21.5 Welding Procedure

- L.21.5.1 Proper precautions shall be instituted to ensure that all welding is carried out under conditions affording protection against the effects of moisture, wind and severe cold.

- L.21.5.2 The type and disposition of connections and sequences of welding are to be so planned and executed that any restraint during welding operations is reduced to a minimum.

- L.21.5.3 When stiffening members cross completely finished butt or seam welds, these welds are to be made flush in way of the faying surface. If the butt or seam welding is not completed, the web stiffening members are to be scalloped.

- L.21.5.4 Scallops are to be fitted at the ends of the welded butts in the webs of stiffening members. Alternatively a scallop may be omitted, provided that the butt weld is completed and made flush with the plate before the fillet weld is made.

- L.21.5.5 Local concentration of welds should be avoided. Seam welds and welds joining continuous longitudinal members of plating shall not be carried beyond an unwelded butt or butt-lap joint, until the butt joint has been welded.
- L.21.5.6 The minimum allowable distance that seam welds and welds joining continuous longitudinal members to plating shall stop clear of an unwelded butt or butt-lap joint, shall be 300 mm.
- L.21.5.7 Where thick plates of different thicknesses are butt welded the thicker plate is to be chamfered 1 in 5 where the difference in thickness exceeds 3 mm.
- L.21.5.8 The length of intermittent welds is to be measured over the correctly proportioned fillet, clear of end craters.
- L.21.5.9 Intermittent welds are to be doubled at the ends of all structural members. Additionally, the welding is to be carried round the ends of brackets, lugs, etc.
- L.21.5.10 The maximum reinforcement of fillet welds should be in accordance with the following scale:

| <i>Size of<br/>fillet weld<br/>mm</i> | <i>Maximum<br/>reinforcement<br/>mm</i> |
|---------------------------------------|---|
| less than 12                          | 2                                       |
| 12 and over but less than 25          | 3                                       |
| 25 and over                           | 4                                       |

- L.21.5.11 Gaps exceeding the 3 mm maximum required between abutting edges of plates prepared for vee type welds shall be reduced by building up one edge by welding and, when cool, trimming to the required angle and gap before the two edges are welded. Where the gap is excessive a plate of not less than 230 mm wide is to be inserted. Bridging of gaps by weaving is not to exceed 3 times the diameter of the electrode in use.

L.21.6 Electrodes

- L.21.6.1 Electrodes used for manual electric arc welding are to be of an approved type having regard to the quality of the parent metal and the position on a type of joint on which they are to be used.
- L.21.6.2 Electrodes shall be stored in a dry place, adequately protected from the effects of weather and in conformity with any special recommendation of their manufacturer.
- L.21.6.3 Electrodes which have become affected by dampness, but not otherwise damaged, may be used after being dried out in a manner approved by the electrode manufacturer.
- L.21.6.4 Electrodes which have areas of flux broken away or damaged shall not be used.

L.21.7 Inspection

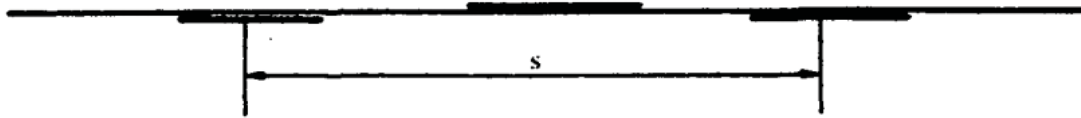
- L.21.7.1 Effective arrangements are to be made for the inspection of welds to ensure that welding has been satisfactorily completed.
- L.21.7.2 Visual inspection may require to be supplemented by the production of test pieces or the use of an approved method of non-destructive crack or flaw detection. All defective sections of welds are to be cut out, carefully re-welded and re-examined.

L.21.8 Welded Joints and Connections

- L.21.8.1 In general, the preparation of the edges of plates to be joined by manual welding are to comply with the requirements of Schedule 1.
- L.21.8.2 Fillet welds for various structural connections are to be as required by Schedule I.
- L.21.8.3 The connections for various structural members should be made by fillets on both sides of the abutting plate and in general the design is to comply with the requirements of Schedule I. Where the abutting plate is bevelled, a sealing run should be applied on the reverse side.
- L.21.8.4 Details of scallops and notches are to be in accordance with Schedule I.
- L.21.8.5 Where slot welds are permitted, they shall be arranged and have dimensions as shown in Schedule I.

**WELDED JOINTS AND CONNECTIONS**  
**I SIZE AND SPACING OF FILLET WELDS**

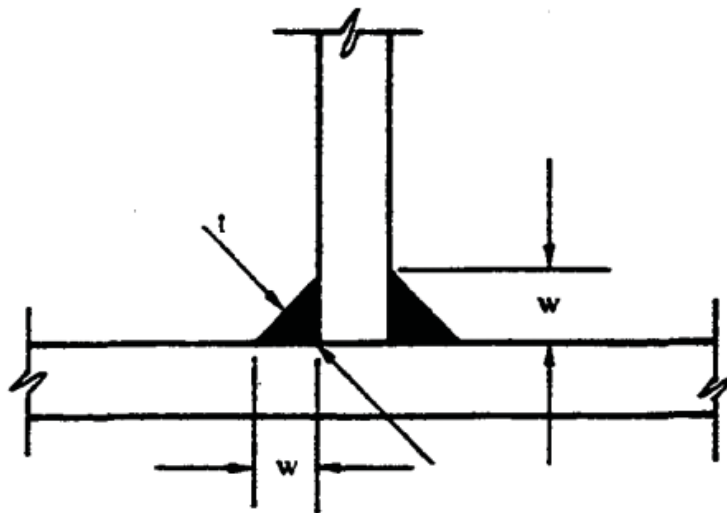
1. Staggered intermittent (S.I.)



2. Chain intermittent (C.I.)



**II SIZES OF INTERMITTENT FILLET WELDS**



NOTES: TABLE "A" –

1. Where a double continuous weld is required in Table A or where double continuous welds are adopted in preference to intermittent welds, the size of the welds may be reduced by 1.6mm provided that such reduction shall not apply to plates up to 4.8mm in thickness.
2. All members that are crossed by or carry the ends of structural members are to have a pair of matched intermittent welds on each side of such intersection.
3. Unbracketed stiffeners of shell, watertight and oiltight bulkheads and house fronts are to have double continuous welds for one tenth of their length at each end. Unbracketed stiffeners of non-tight structural bulkheads, deckhouses sides and after ends are to have a pair of matched intermittent welds at each end.
4. "o" fillets are to be staggered.

"#" normal size fillet "W" may be reduced 1.5mm.

## SCHEDULE 1

**TABLE A**  
**REQUIRED TYPE AND SIZE OF WELDS FOR VARIOUS**  
**STRUCTURAL CONNECTIONS**

| LESSER THICKNESS OF MEMBERS JOINED  | Not over 5 mm | Over 5 to 6.5mm   | Over 6.5 to 8 mm | Over 8 to 9.5mm |
|---|---------------|-------------------|------------------|-----------------|
| LENGTH OF FILLET WELD   | 40            | 65                | 75               | 75              |
| NOMINAL SIZE OF FILLET-w-   | 3             | 5                 | 6.5              | 6.5             |
| NOMINAL SIZE OF FILLET-t-   | 2             | 3.5               | 4.5              | 4.5             |
|   |               | SPACING-s-        |                  |                 |
| <b>Single Bottom</b>  |               |                   |                  |                 |
| Centre Keelson to Keel Plate . . . . .  |               | double continuous |                  |                 |
| Floors to Centre Keelson. . . . .   |               | double continuous |                  |                 |
| Intercostals to Bar Keel. . . . .   |               | double continuous |                  |                 |
| Intercostals to Floors. . . . .   |               | double continuous |                  |                 |
| Rider Bar to Centre Keelson or Intercostals (Tee Joint) . . . . .                           | *260          | *260              | *280             | *300            |
| Rider Bar to Floors (Tee Joint) in way of Engines and Propellers. . . . .                   |               | double continuous |                  |                 |
| Rider Bar to Floors Else Where (Tee Joint) . . . . .  | *260          | *260              | *280             | *300            |
| Rider Bar to Floors (Corner Joint) . . . . .  |               | double continuous |                  |                 |
| Floors to Bottom in way of Propellor . . . . .  |               | double continuous |                  |                 |
| Floors to Bottom in way of Engine . . . . .   |               | double continuous |                  |                 |
| Floors to Bottom in Frd. 0.25L . . . . .  | 225           | 225               | 250              | 225             |
| Floors to Bottom in Tanks . . . . .   | *225          | *225              | 250              | 225             |
| Floor to Bottom Else Where . . . . .  | *300          | *300              | 300              | 275             |
| <b>Frames</b>   |               |                   |                  |                 |
| Transverse Frames to Side Shell in Frd. 0.25L . . . . .                                     | *225          | *225              | 250              | 225             |
| Transverse Frames to Side Shell in Tanks. . . . .   | *225          | *225              | 250              | 225             |
| Transverse Frames to Side Shell Else Where. . . . .   | *300          | *300              | 300              | 275             |
| Longitudinal Frames to Side Shell in Frd. 0.25L. . . . .                                    | *225          | *225              | 250              | 225             |
| Longitudinal Frames to Side Shell in Tanks. . . . .   | *225          | *225              | 250              | 225             |
| Longitudinal Frames to Side Shell Else Where . . . . .                                      | *300          | *300              | 300              | 275             |
| Frame Brackets to Frames, Floors and Deck Beams . . . . .                                   |               | double continuous |                  |                 |
| Rider Bars to Frames (Tee Joint) . . . . .  | 260           | 260               | 280              | 300             |
| Rider Bars to Frames (Corner Joint) . . . . .   |               | double continuous |                  |                 |
| <b>Decks</b>  |               |                   |                  |                 |
| Peripheries of Strength Decks, Exposed Decks and all Watertight or Oiltight Decks . . . . . |               | double continuous |                  |                 |
| Beams (Transverse or Longitudinal) to Decks in way of Tanks . . . . .                       | *225          | *225              | 250              | 225             |
| Beams (Transverse or Longitudinal) to Decks Else Where . . . . .                            | *300          | *300              | 300              | 275             |
| Beam Knees to Beams, Frames and Other End Attachments. . . . .                              |               | double continuous |                  |                 |
| Hatch Coamings to Exposed Decks. . . . .  |               | double continuous |                  |                 |
| Transverse or Deep Beams to Decks in Way of Tanks . . . . .                                 | 200           | 200               | 225              | 200             |
| Transverse or Deep Beams to Decks Else Where . . . . .                                      | 225           | 225               | 250              | 225             |
| <b>Girders and Webs</b>   |               |                   |                  |                 |
| Girders and Webs to Shell and Bulkheads or Decks in Tanks . . . . .                         | 200           | 200               | 225              | 200             |
| Girders and Webs to Shell and to Bulkheads or Decks Elsewhere. . . . .                      | 225           | 225               | 250              | 225             |
| <b>Webs to Face Plate Where Area of Face Plate Does Not Exceed 64.5 Sq. cm. . . . .</b>     |               |                   |                  |                 |
|   | *250          | *250              | 300              | 275             |

|  |      |      |                   |     |
|--|------|------|-------------------|-----|
| Webs to Face Plate Where Area of Face Plate Exceeds<br>64.5 Sq. cm                                 | -    | -    | 250               | 225 |
| Girder to Deck Beams   |      |      | double continuous |     |
| Web to Deck, Side and Bottom Longitudinals   |      |      | double continuous |     |
| Girder End Brackets  |      |      | double continuous |     |
| <b>Bulkheads</b>   |      |      |                   |     |
| Peripheries of Swash Bulkheads   | 200  | 200  | 225               | 200 |
| Peripheries of Nontight Structural Bulkheads   | 200  | 225  | 250               | 225 |
| Peripheries of Watertight or Oiltight Bulkheads  |      |      | double continuous |     |
| Stiffeners to Deep Tank Bulkheads  | *300 | *300 | 300               | 275 |
| Stiffeners to Watertight Bulkheads (Except in Tanks) and<br>Deckhouse Fronts <i>See Note 3</i>     | *300 | *300 | 300               | 275 |
| Stiffeners to Nontight Structural Bulkheads, Deckhouse Sides<br>and Afterends <i>See Note 3</i>    | *300 | *300 | *300              | 300 |
| Stiffener Brackets to Beams, Decks, etc  |      |      | double continuous |     |
| <b>Machinery Seatings</b>  |      |      |                   |     |
| Machinery Seatings to Floors and Shell   |      |      | double continuous |     |
| <b>Double Bottoms</b>  |      |      |                   |     |
| Floor to Shell in Frd. 0.25L   | 225  | 225  | 250               | 225 |
| Floors to Shell in Way of Engines  |      |      | double continuous |     |
| Floors to Shell Elsewhere  | *300 | *300 | 300               | 275 |
| Floors to Centre Vertical Keel Plate   |      |      | double continuous |     |
| Floors to Margin Plate   |      |      | double continuous |     |
| Floors to Inner Bottom in Frd. 0.25L   | *275 | *275 | 275               | 250 |
| Floors to Inner Bottom in Way of Engines   |      |      | double continuous |     |
| Floors to Inner Bottom Elsewhere   | *300 | *300 | 300               | 275 |
| Wide Spaced Floors with Longitudinal Framing to Shell<br>and Inner Bottom                          |      |      | double continuous |     |
| Nontight Centre Girder to Inner Bottom or Plate Keel<br>in way of Engines and to Shell or Bar Keel |      |      | double continuous |     |
| Nontight Centre Girder to Inner Bottom or Plate Keel<br>Elsewhere                                  | 150  | 150  | 150               | 125 |
| Watertight or Oiltight Centre Girder to Inner Bottom,<br>Rider Plate, Shell or Bar Keel            |      |      | double continuous |     |
| Intercostals and Continuous Longitudinal Girders to Shell<br>and to Inner bottom in way of Engines |      |      | double continuous |     |
| Intercostals and Continuous Longitudinal Girders to Shell<br>Else Where and to Floors              | *275 | *275 | 275               | 250 |
| Watertight and Oiltight Periphery Connections of Longitudinal<br>Girders in Double Bottom          |      |      | double continuous |     |
| <b>Deckhouses Superstructures etc.</b>   |      |      |                   |     |
| The Boundaries of Deckhouses and Superstructures etc.<br>to Deck Plate                             |      |      | double continuous |     |

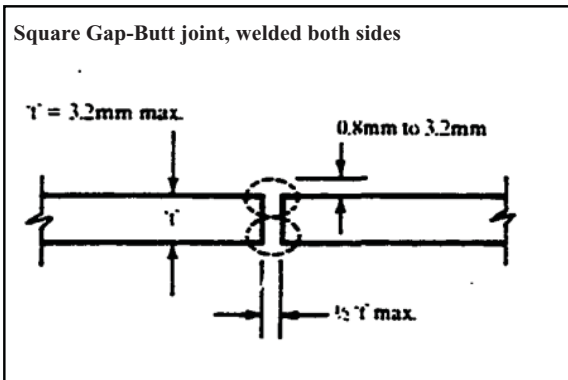
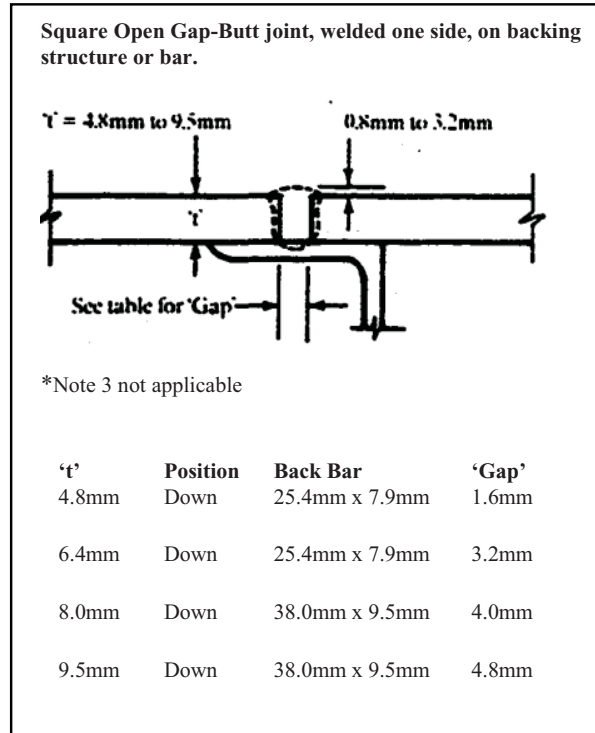
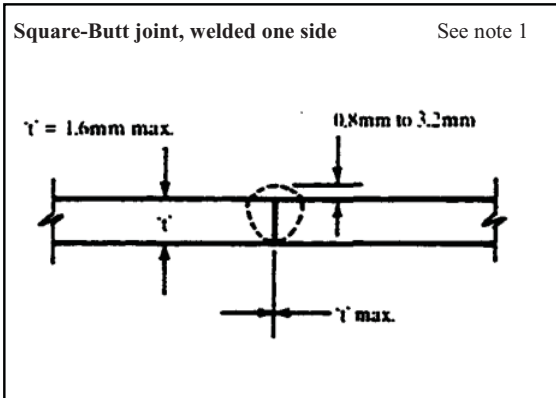
**BUTT JOINTS**

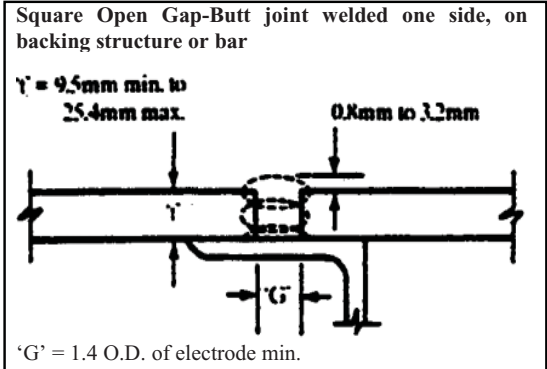
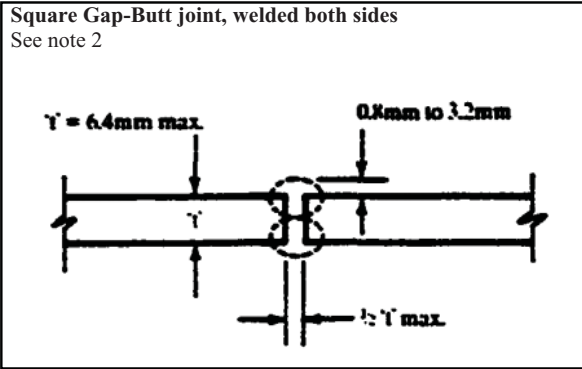
**IMPORTANT** Notes apply only to details where referenced.

*Note 1* This joint shall not be used when root of weld is subject to tension bending.

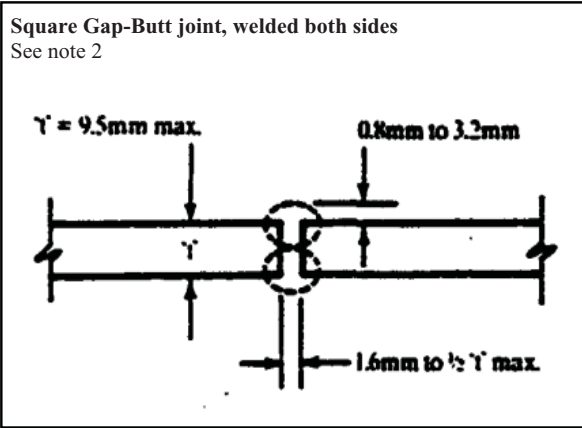
*Note 2* Root of weld shall be chipped out to sound metal before opposite side is welded.

*Note 3* Dimension 't' is plate thickness to which normally applicable. If desired, thickness may be greater for joints indicated.





'G' = 1.4 O.D. of electrode min.  
Backing bars = 38.0mm x 9.5mm F.M.S



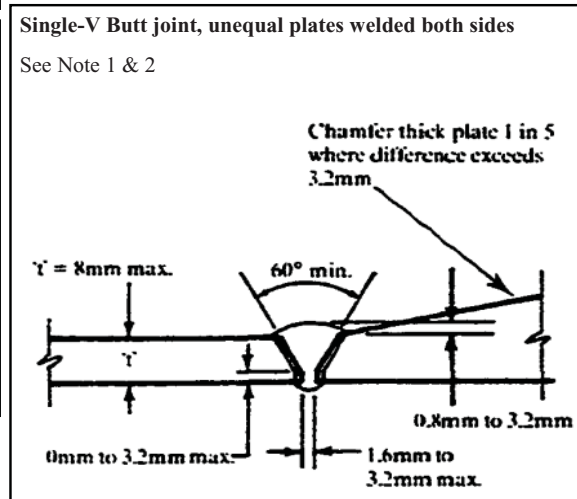
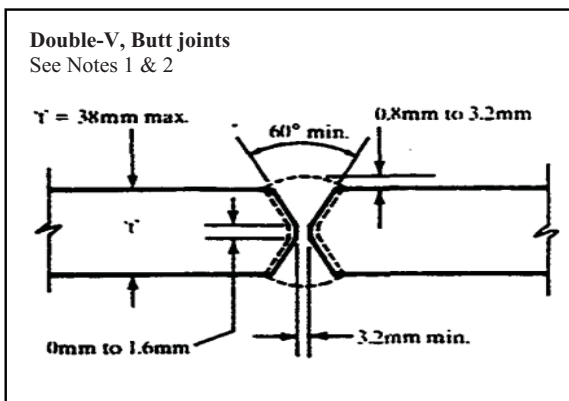
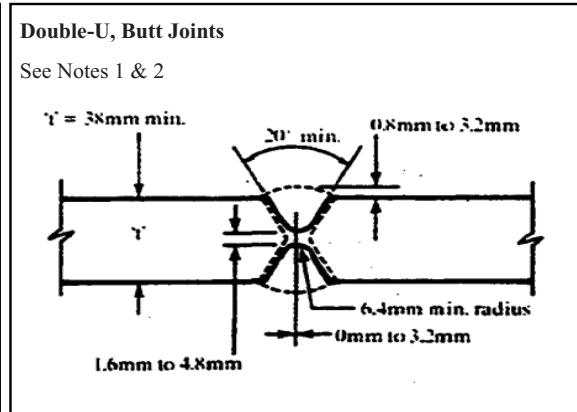
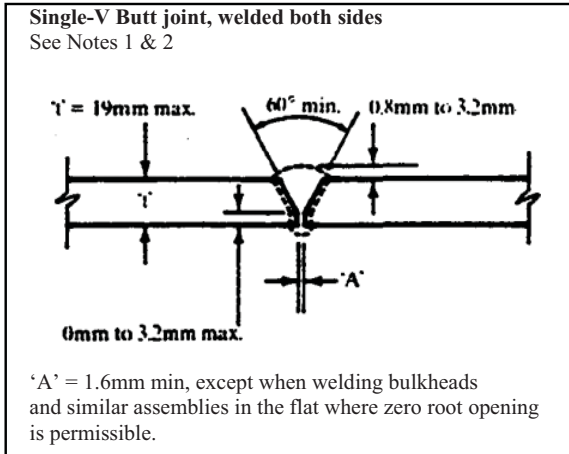
| 't'    | Position | 'Gap'  |
|--------|----------|--------|
| 9.5mm  | Down     | 9.5mm  |
| 12.7mm | Down     | 9.5mm  |
| 15.9mm | Down     | 12.7mm |
| 19.0mm | Down     | 12.7mm |
| 22.2mm | Down     | 12.7mm |
| 25.4mm | Down     | 12.7mm |

**BUTT JOINTS**

**IMPORTANT** Notes apply only to details where referenced.

*Note 1* Root of weld shall be chipped out to sound metal before opposite side is welded.

*Note 2* Dimension 't' is plate thickness to which normally applicable. If desired, plate thickness may be greater for joints indicated.

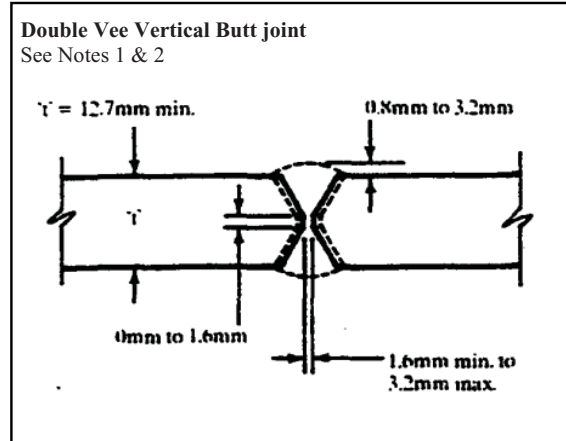
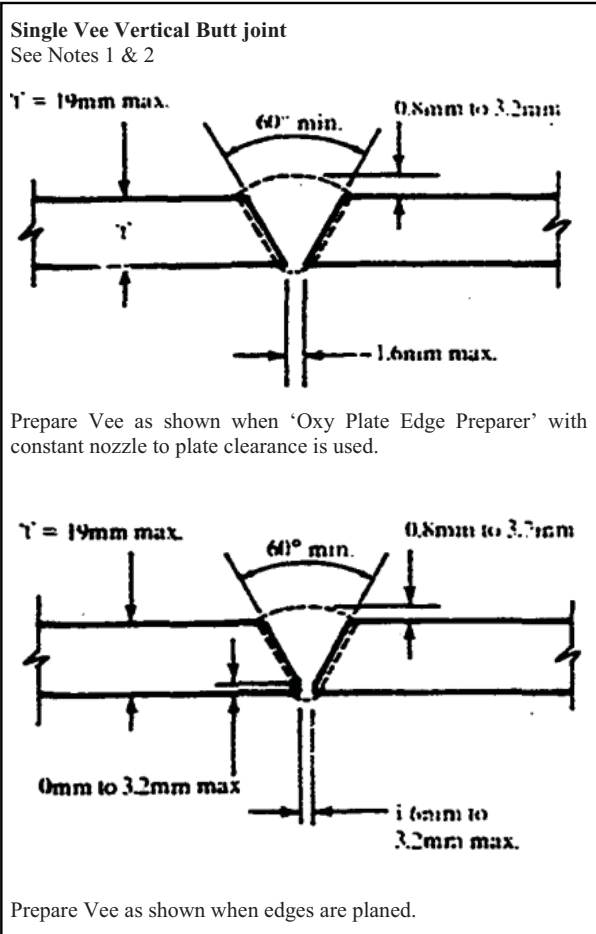


**SHELL BUTT JOINTS**

**IMPORTANT** Notes apply only to details where referenced.

*Note 1* Root of weld shall be chipped out to sound metal before opposite side is welded.

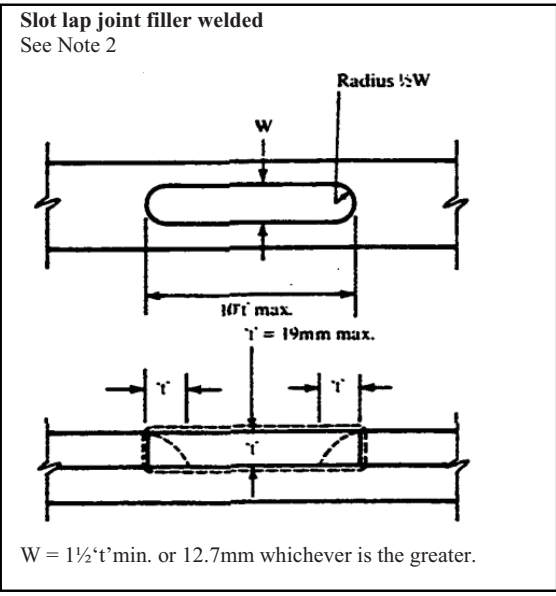
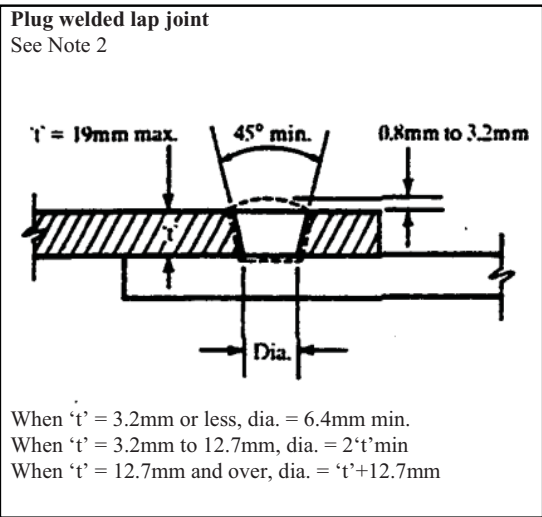
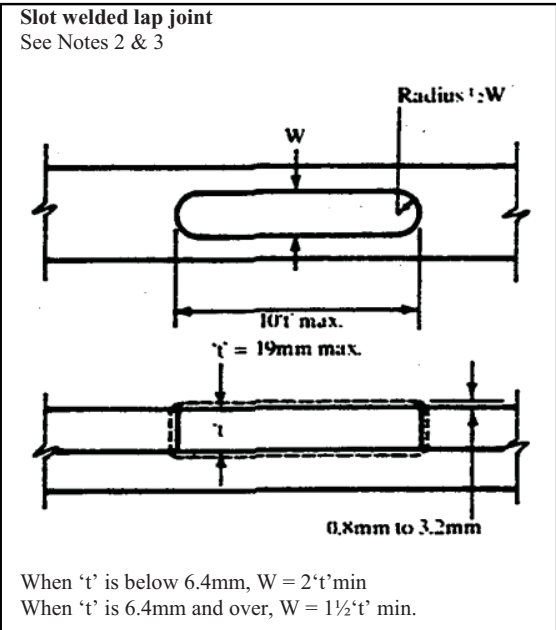
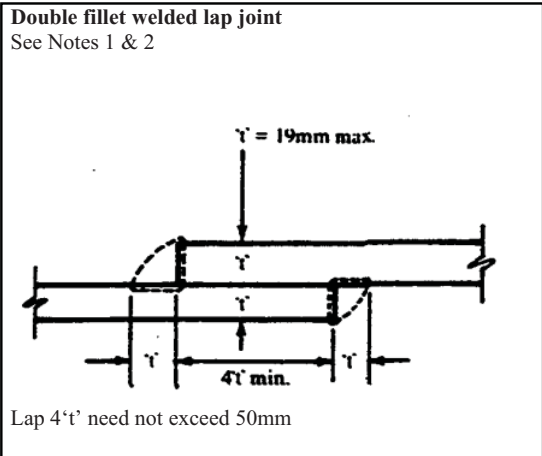
*Note 2* Dimension 't' is plate thickness to which normally applicable. If desired, thickness may be greater for joints indicated.



**LAP JOINTS**

**IMPORTANT** Notes apply only to details where referenced.

- Note 1* This joint shall not be used on members subject to high stresses or compression loading.
- Note 2* Dimension 't' is plate thickness to which normally applicable. If desired, thickness may be greater for joints indicated.
- Note 3* Slot welds shall be bevelled 45° included angle when 't' is less than 12.7 mm.



**TEE JOINTS**

**IMPORTANT** Notes apply only to details where referenced.

*Note 1* Where the clearance between members to be joined 'A' is greater than 1.6 mm the size of fillet weld shall be the size specified plus the clearance.

*Note 2* Dimension 't' is plate thickness to which normally applicable. If desired, plate thickness may be greater for joints indicated.

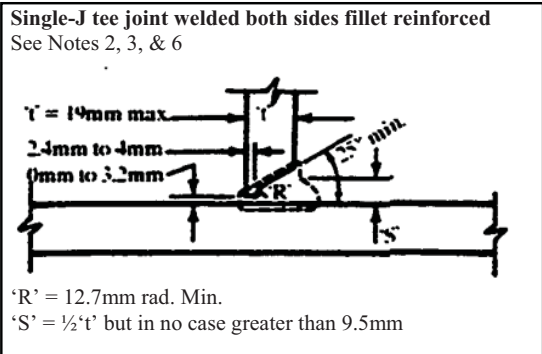
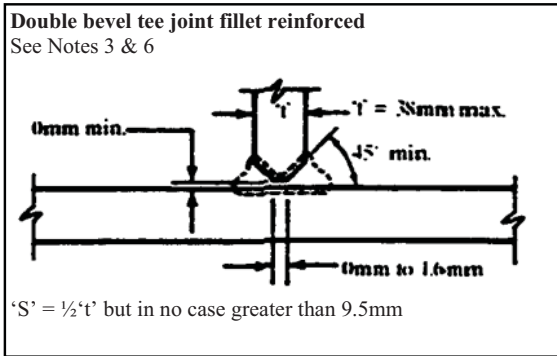
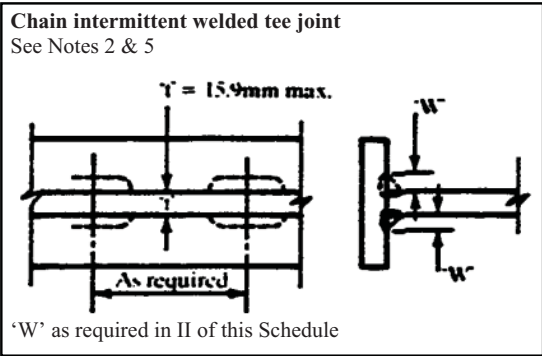
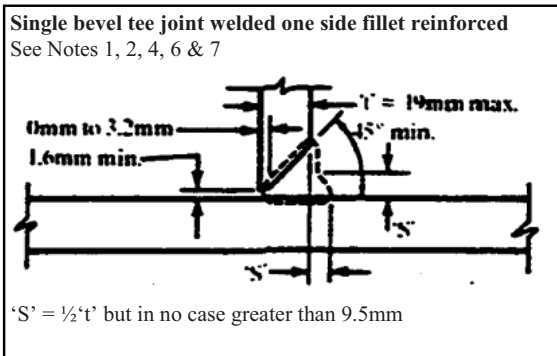
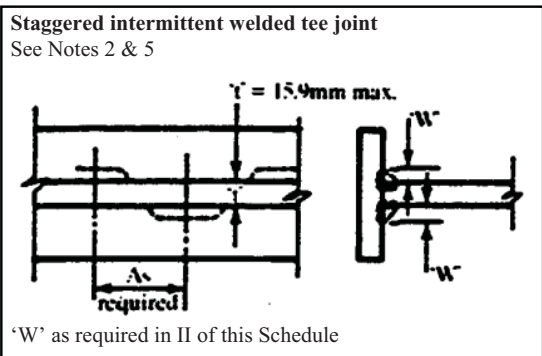
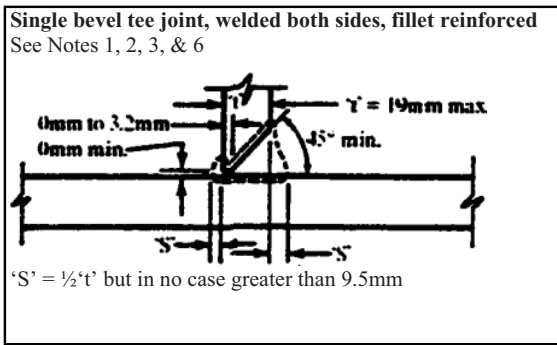
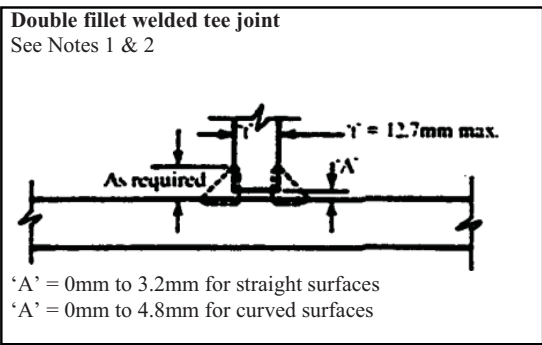
*Note 3* Root of weld shall be chipped out to sound metal before opposite side is welded.

*Note 4* This joint shall not be used when root of weld is subject to tension bending.

*Note 5* The length of intermittent fillet welds shall be 76 mm clear of craters.

*Note 6* When this joint is used no obstruction shall be closer than 456 mm to the edge of the bevelled plate.

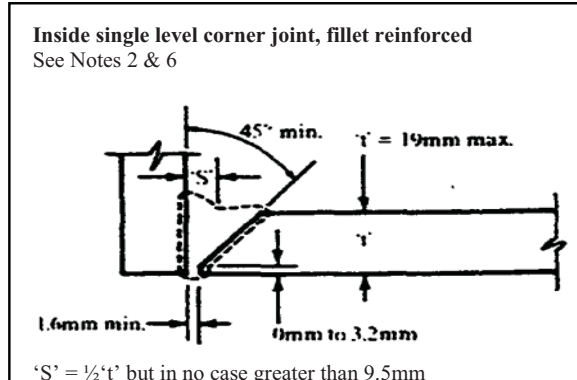
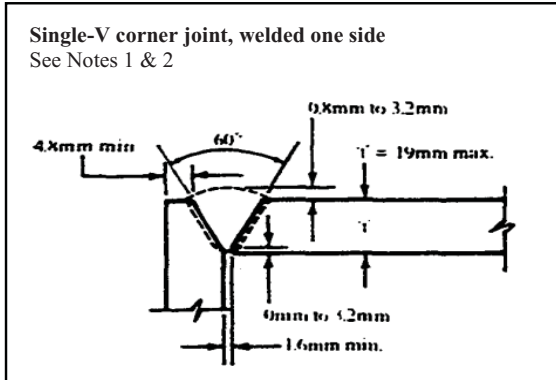
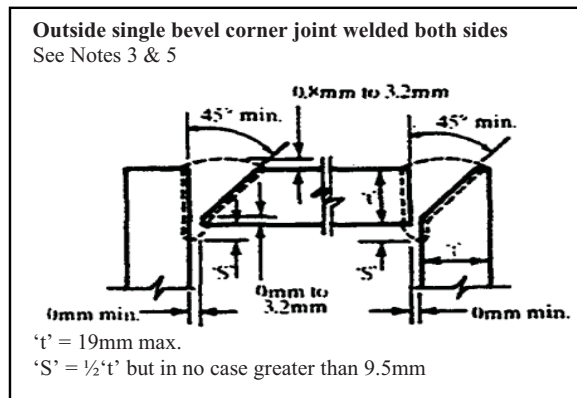
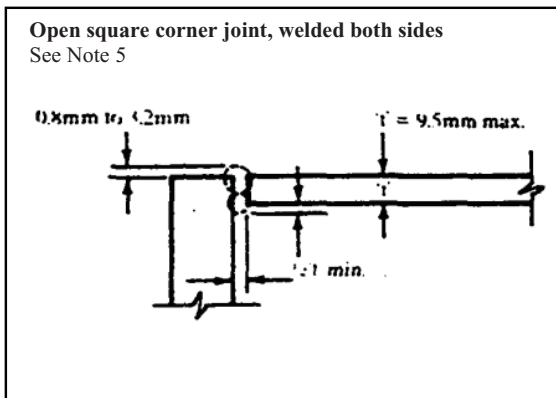
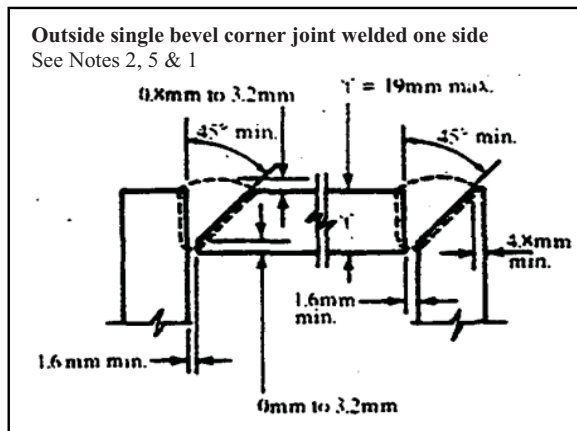
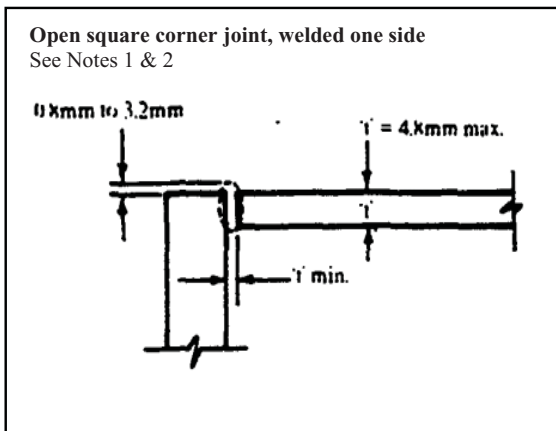
*Note 7* This joint shall not be used without approval of The Surveyor.



**CORNER JOINTS**

**IMPORTANT** Notes apply only to details where referenced.

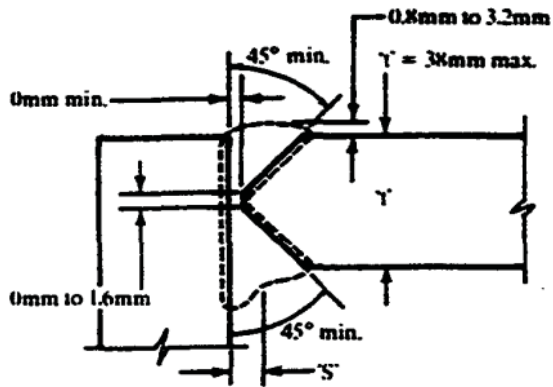
- Note 1* This joint shall not be used without approval of The Surveyor.
- Note 2* This joint shall not be used when root of weld is subject to tension bending.
- Note 3* Root of weld shall be chipped out to sound metal before opposite side is welded.
- Note 4* Dimension 't' is plate thickness to which normally applicable. If desired, plate thickness may be greater for joints indicated.
- Note 5* When this joint is used in the flat and overhead positions of welding no obstruction shall be closer than 152mm to the edge of the edge of the bevelled plate. When used in horizontal and vertical positions of welding no obstruction shall be closer than 456mm to the edge of the bevelled plate.
- Note 6* When this joint is used no obstruction shall be closer than 456mm to the edge of the bevelled plate.



**Double level corner joint, fillet reinforced**

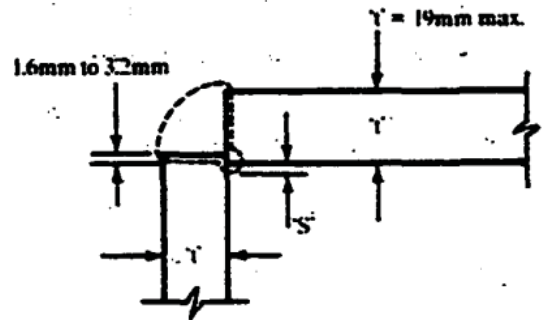
**Double fillet welded corner joint**

See Notes 3 & 6



'S' = 1/2't' but in no case greater than 9.5mm

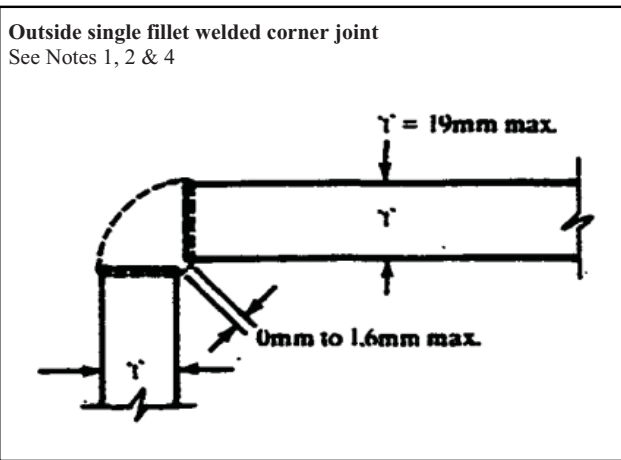
See Notes 3 & 4



'S' = 1/2't' but in no case greater than 9.5mm

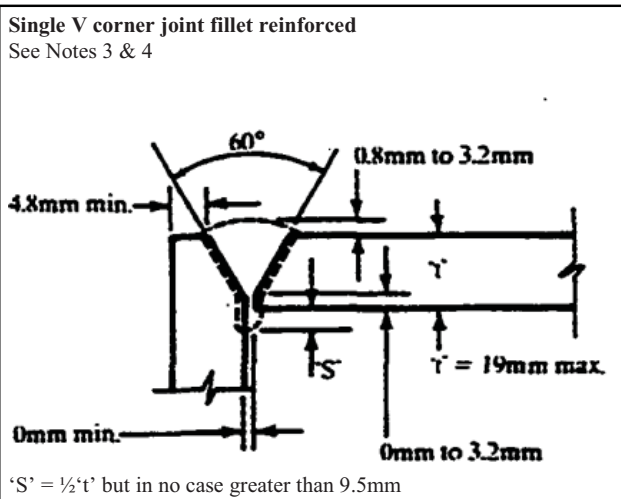
Outside single fillet welded corner joint

See Notes 1, 2 & 4



Single V corner joint fillet reinforced

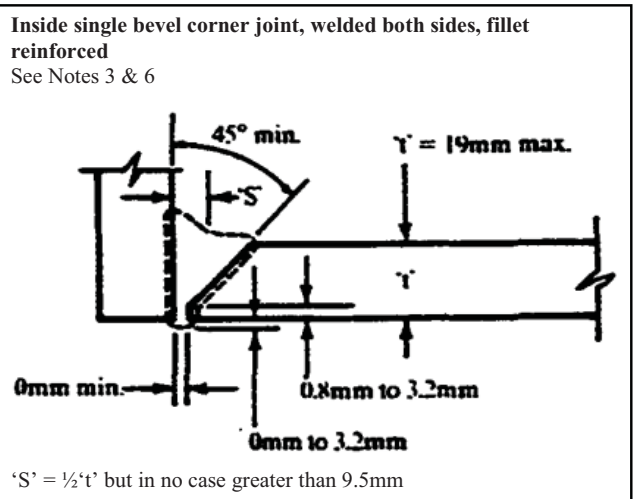
See Notes 3 & 4



'S' = 1/2't' but in no case greater than 9.5mm

Inside single bevel corner joint, welded both sides, fillet reinforced

See Notes 3 & 6



'S' = 1/2't' but in no case greater than 9.5mm