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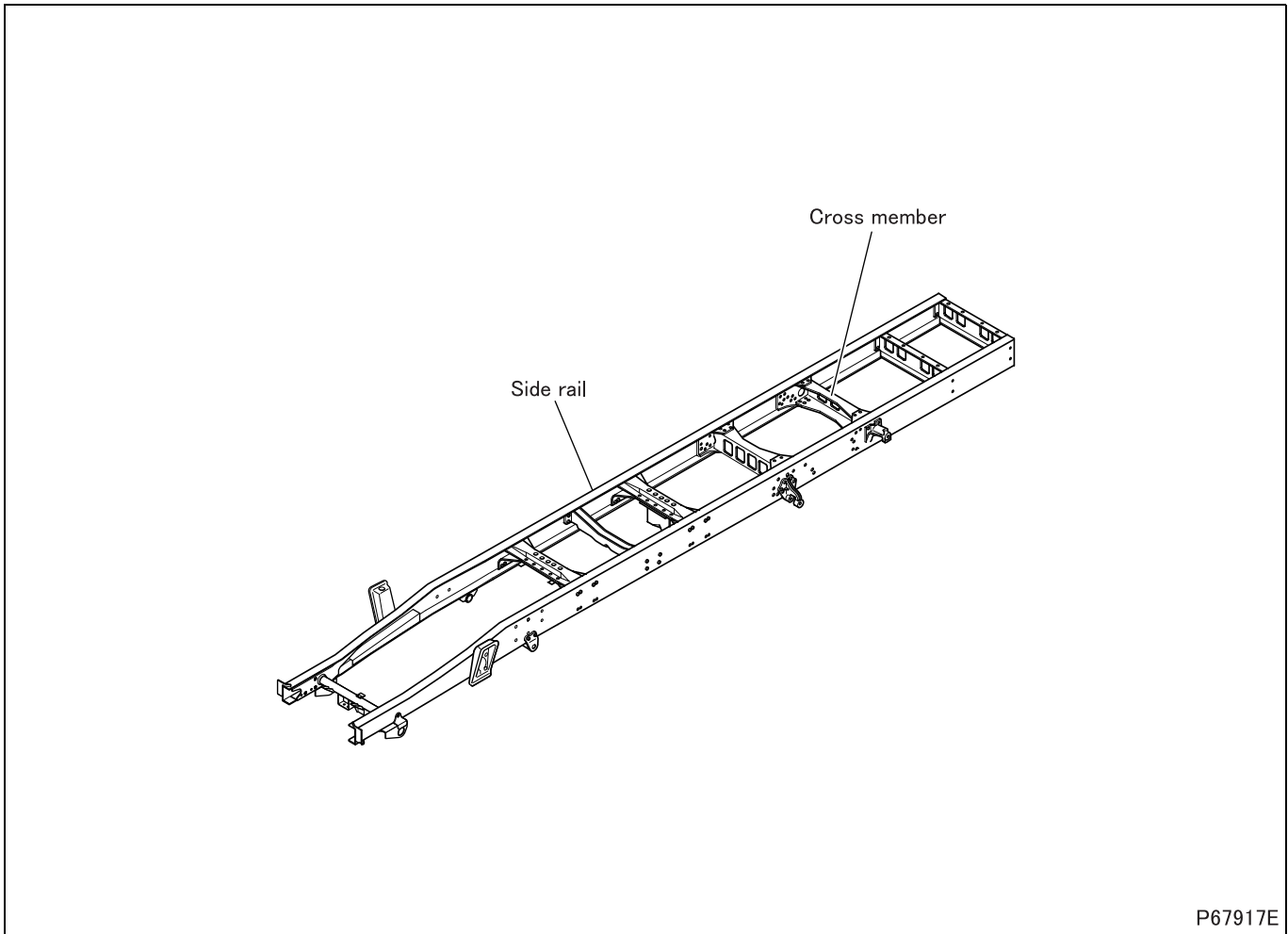
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# SPECIFICATIONS

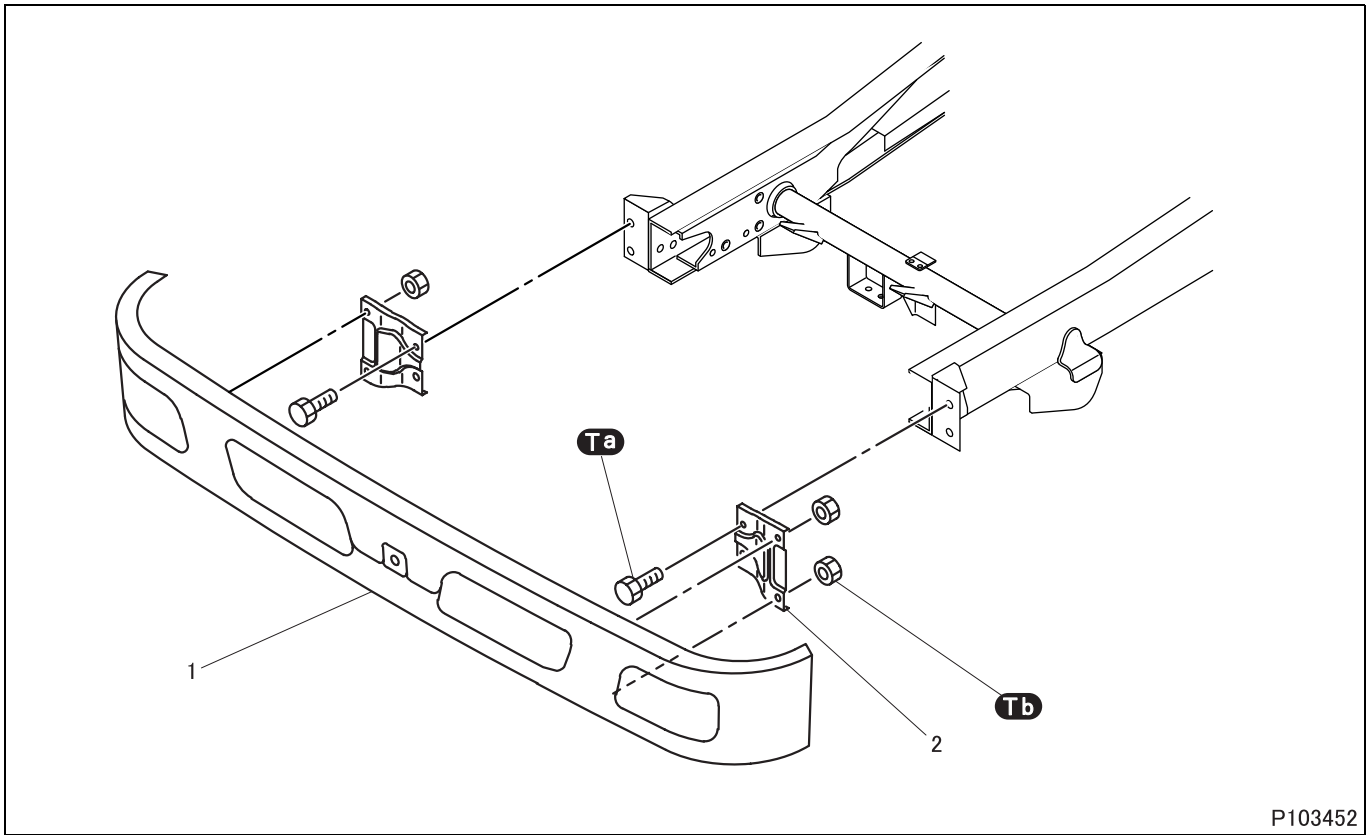
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Item	Specifications
Frame type	Ladder type
Cross section configuration of side rail	 shaped (open) channel section



- The frame has cross members fastened to the web of side rails (lateral linkage) so that stress on the joints is very small. This allows joint rivets to maintain tightness and ensures long-lasting high torsional stiffness.
- Unlike vertical linkage where cross members are fastened to the flange of side rails, no rivets appear on top of the frame, making the body mounting greatly easier.

# FRONT BUMPER



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## ● Removal sequence

- 1 Front bumper
- 2 Bumper stay

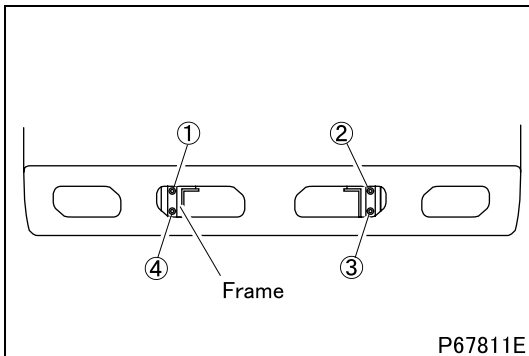
## ● Installation sequence

Follow the removal sequence in reverse.

## Tightening torque (Unit: N-m {ft.lbs, kgf-m})

Mark	Parts to be tightened	Tightening torque	Remarks
<b>Ta</b>	Bolt (bumper stay mounting)	45 to 54 {33 to 40, 4.6 to 5.5}	–
<b>Tb</b>	Nut (front bumper mounting)	26 to 31 {19 to 23, 2.7 to 3.2}	–

## ◆ Installation procedure ◆



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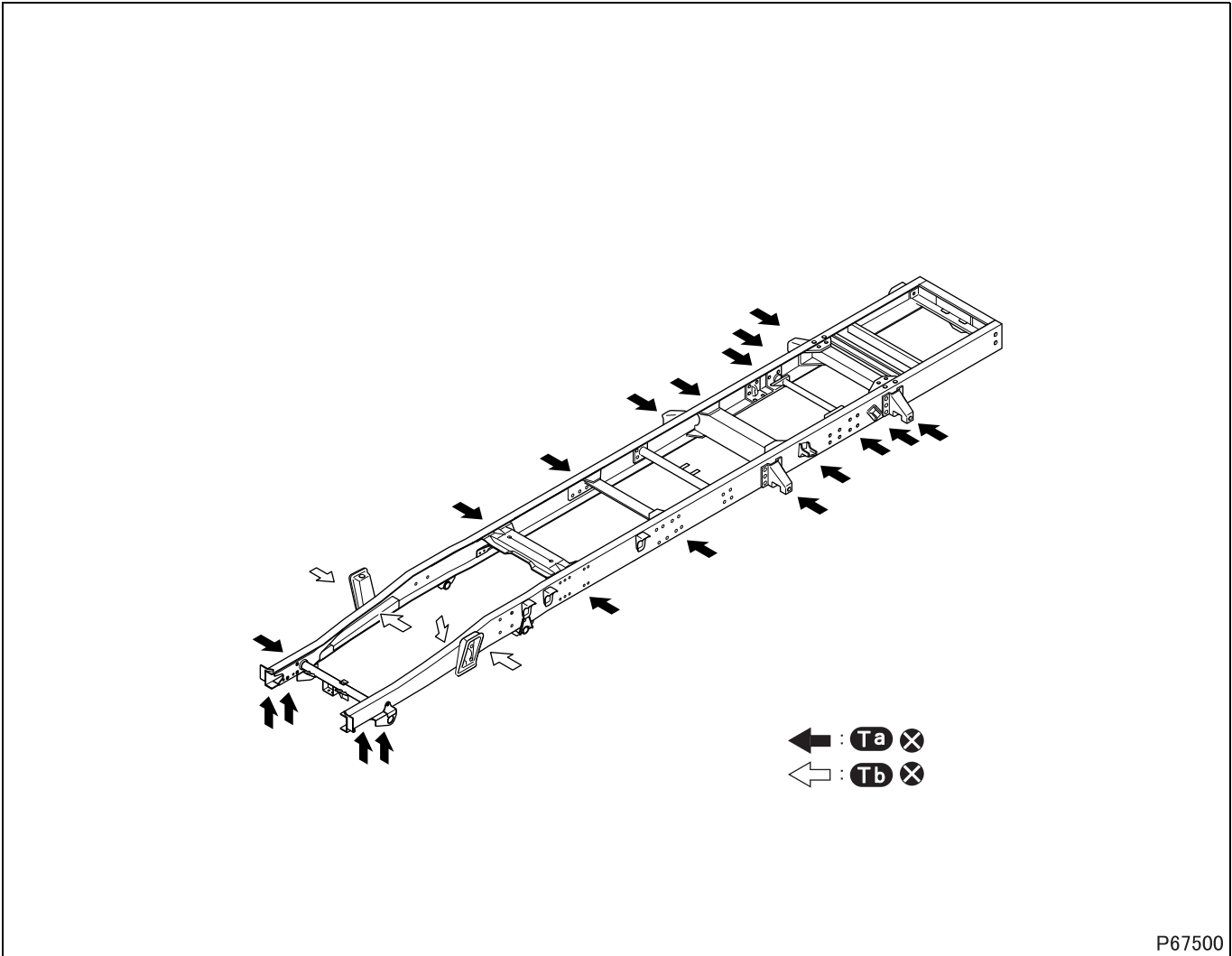
### ■ Installation: Bumper stay

- Install the bumper stay on the frame by tightening the bolts (four places) to the specified torque in the order of the numbers (1 to 4) indicated in the illustration.

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M E M O

# FRAME



⊗: Non-reusable parts

## CAUTION

- Since the mounting bolts and nuts are tightened by a torque-to-yield method, they must not be reused.

### Tightening torque (Unit: N-m {ft.lbs, kgf-m})

Mark	Parts to be tightened	Tightening torque	Remarks
<b>Ta</b>	M10 bolt or nut	60 to 80 {43 to 58, 6 to 8}	–
<b>Tb</b>	M12 bolt or nut	98 to 120 {72 to 87, 10 to 12}	–

### ◆ Cleaning procedure ◆

#### ■ Cleaning: Frame

- Thoroughly remove mud, grease, rust etc. from the outer and inner surfaces of the frame.

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**◆ Inspection procedure ◆****WARNING** ⚠

Improper welding technique may fatigue the frame and lead to structural failure and serious personal injury. The frame rails are made of heat treated steel. Only experienced, qualified persons using proper equipment should attempt welding the frame rails.

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**CAUTION** ⚠

The vehicle is equipped with electronic control units. Serious damage to ECUs and components may result when welding unless the following precautions are taken.

- Never allow an electronic component to be situated between the ground electrode and the weld site.
  - Never lay welding cables on, near, or across any electronic component or wiring.
  - Protect electronic components and wiring near the weld site from heat and splatter.
    - 1 Park the vehicle, shut down the engine, and set the parking brake. Chock the tires.
    - 2 From the batteries, disconnect all negative cables first, then the positive cables, and prevent them from making connection with the frame or any other electrically conductive surface.
    - 3 Disconnect all wiring from electronic control modules near the weld site, including any installed by the customer.
    - 4 Attach the ground electrode as close as possible to the weld site (within 18").
    - 5 Remove paint, rust, and grease to provide a clean, bare metal connection for the ground electrode. When welding work is completed, apply touch-up paint to protect the frame rail.
  - Avoid gas welding because heat embrittles the material of welded area. Be sure to use electric welding.
  - Electric welding could allow the welding current to reverse through ground circuit and burn electrical components. To prevent this, be sure to disconnect negative cable from the battery and ground the welding machine at a point near the weld zone before work.
  - For electric welding, follow other precautions given elsewhere.
  - If there are any combustibles, such as pipeline, wiring harness, rubber part and fuel tank, near the weld zone, be sure to cover them for protection.
  - Use low-hydrogen type coated CO<sub>2</sub> and arc welding electrodes for welding and check that there are not harmful defects such as undercut and blow hole after welding.
  - Preheat the area around weld zone to approximately 50 to 350°C {120 to 660°F} before welding when the workshop temperature is below 0°C {32°F}.
  - Be sure to protect mountings that may be affected by heat, such as main sills, using heat insulators or the like.
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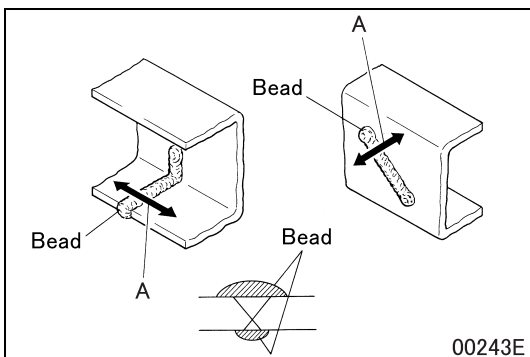
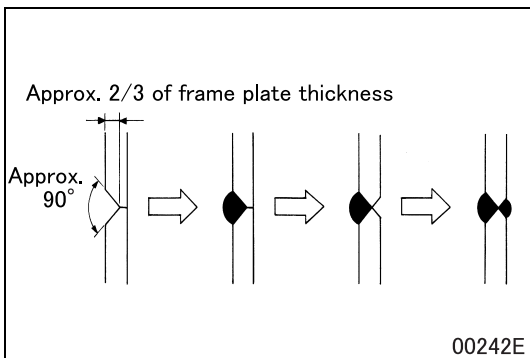
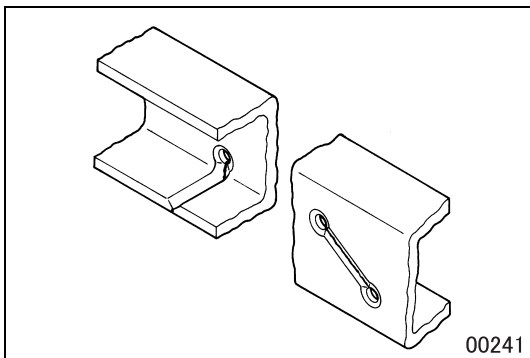
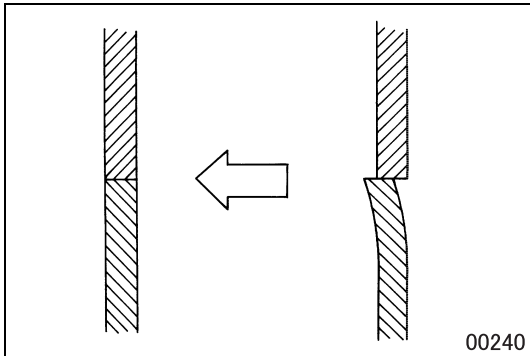
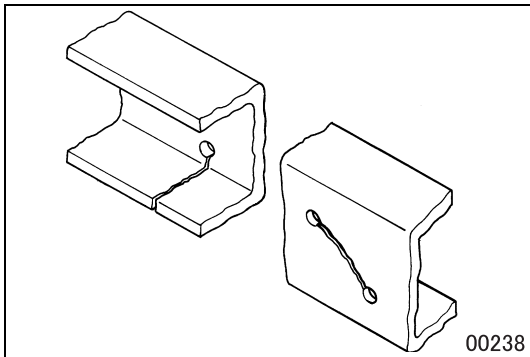
**■ Inspection: Frame****(1) Inspection for deformation**

- If deformation or any other defect is found, repair the frame.

**(2) Inspection for cracks**

- Remove paint from suspected areas and carefully inspect exposed surfaces for cracks.
- If visual inspection is difficult, perform dye check or any other suitable examination. If a crack is found, repair as follows.

# FRAME



### (3) Repair of crack in frame

- With the vehicle unloaded, level the frame.
- Drill a hole, roughly twice the thickness of frame plate in diameter, 10 mm {0.39 in.} from the inside end of crack.

#### NOTE

- **If crack is within the frame plate, drill holes at both ends of the crack.**

- If the edges of crack are uneven, make them even.

- Using a grinder, cut a 90° V-channel at the crack to a depth of approximately 2/3 of the frame plate thickness, then fill the channel with filler metal by welding.

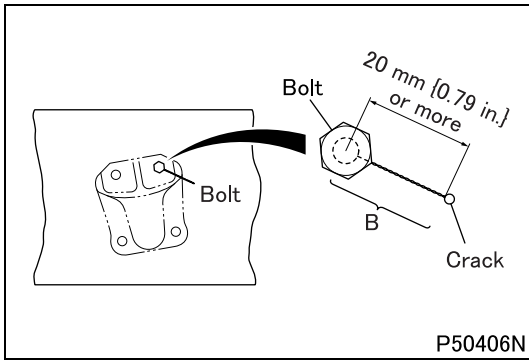
- Then, make a similar V-channel on the opposite side of the weld and fill it with filler metal by electric welding as well. At the same time, deposit metal to cover up the hole or holes at both ends of the crack by welding.

#### NOTE

- **In cold districts, heat the weld zone to approximately 200°C {390°F} after welding.**

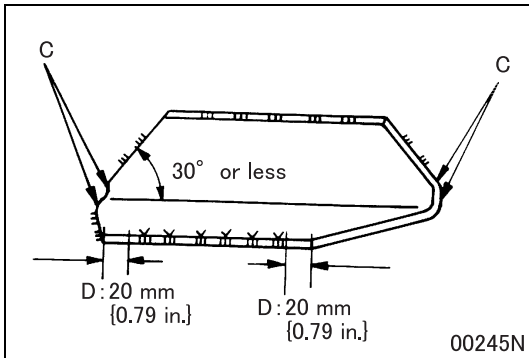
- After welding, run a grinder over the bead at right angles A to remove the hatched portion from the weld on each side of the plate.
- Finish the ground surfaces flat to a thickness equal to the original plate thickness.





#### [Repairing crack from rivet or bolt hole]

- To make the edges of cracked hole even, temporarily tighten bolt in the hole.
- First weld to close the crack at a point at least 20 mm {0.79 in.} apart from the center of the bolt.  
For this welding, see the aforementioned welding procedures for crack repair.
- Remove the temporary bolt. After making hole edges even, weld to close the rest B of the crack. Fill the hole with weld metal at the same time.
- Drill a hole at the location of original hole, and install a rivet or bolt in it.



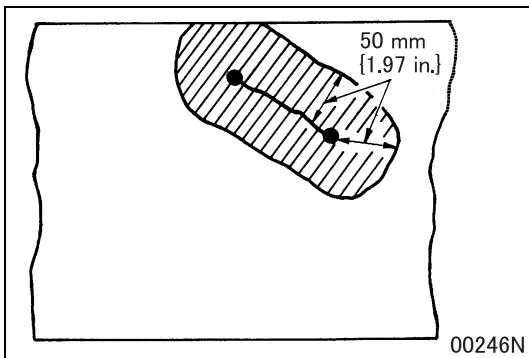
#### [Repairing using reinforcement plate]

- To prevent the concentration of welding stress at both ends C of the reinforcement plate, cut the ends at a bevel of 30° or less for welding. Do not weld at points D.
- The reinforcement plate must have enough to cover the cracked area.

#### NOTE

- **Reinforcement plate thickness: Equal to frame plate thickness**
- **Reinforcement plate material: As specified below or equivalent**

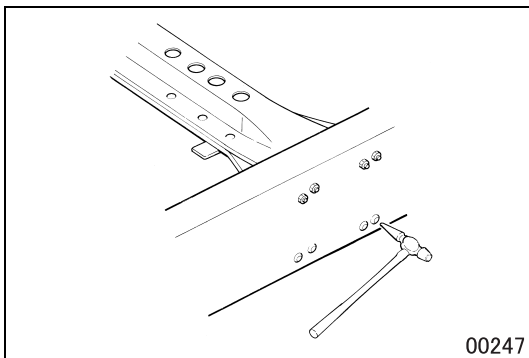
**SAPH440 (Hot rolled steel for automobiles), or  
SS400 (Rolled steel for general structures)**



- After welding, heat the hatched area to 600 to 700°C {1110 to 1292°F}.

#### CAUTION ⚠

- **Be sure to protect mountings that may be affected by heat, such as main sills, using heat insulators or the like.**



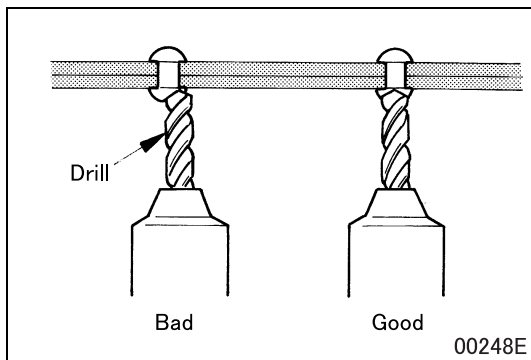
#### (4) Inspection of rivets for looseness

- Lightly tap the head of each rivet using an inspection hammer and feel or listen for the echo to determine if the rivet is loose.
- Rusting between rivet and frame plate is an indication of loosened rivet.

#### CAUTION ⚠

- **Be sure to replace loose rivets. They could break off or allow cracks to develop from the rivet holes, leading to an accident.**

# FRAME

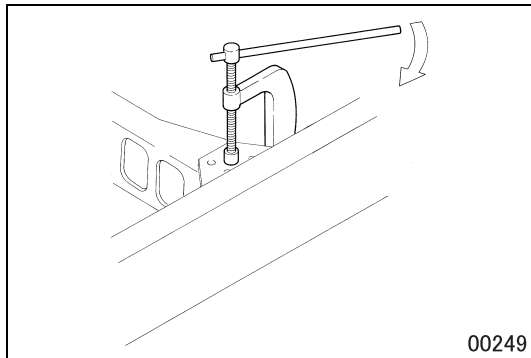


## (5) Replacement of rivet

- To remove a loosened rivet, eliminate its head using a drill or grinder. When a drill is used, make a dent in the middle of the rivet's head and align the drill bit to the dent as shown.

### NOTE

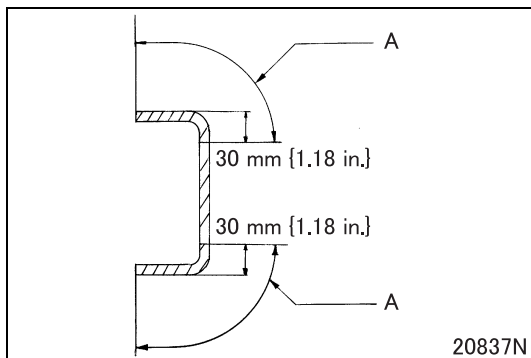
- **The rivet hole must be intact.**



- Before rivetting, clamp the two plates closely together near the rivet hole using a C vice.
- Using a rivetting machine, drive the rivet (cold rivet) into the rivet hole.
- If rivetting is impracticable, ream the rivet hole, drive a reamer bolt in the hole, fully tighten the nut, then weld it in place. As the reamer bolt and nut, use a flange bolt and a flange nut.

## (6) Inspection of bolts and nuts for looseness

- Inspect the bolts attaching cross members to the side rails for looseness. If any loose bolt is found, retighten it to specified torque.



## (7) Drilling hole in frame

### NOTE

This manual does not cover the procedures and calculations necessary to do frame modifications. Before doing any modification to the frame rails, consult your regional service representative.

- When drilling holes in the frame becomes necessary, perform it using care in the following respects.

### CAUTION

- When drilling holes in the side rail, avoid the illustrated ranges A to prevent cracking.
- Grind the edge of drilled hole smooth.
- Avoid drilling a hole in the vicinity of a point where the rigidity of the side rail change sharply, such as an area near the joint to the cross member or an end of the stiffener.
- The diameter of drilled holes must be 11 mm {0.43 in} or smaller and the hole-to-hole distance must be 20 mm {0.79 in} or larger.