WÄRTSILÄ NSD
CORPORATION

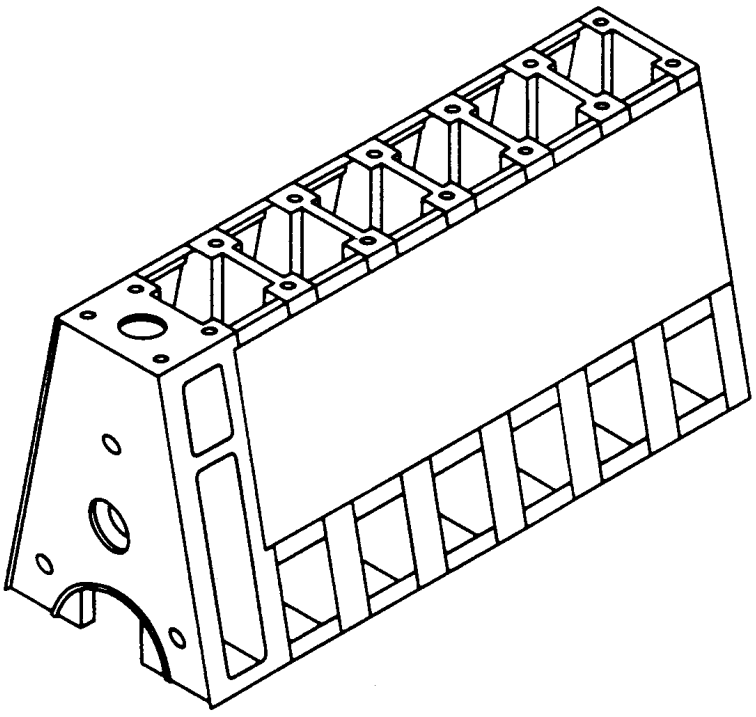
SULZER **RTA Engines**

Service Bulletin

RTA–46
17.06.99

Technical Information to all Owners / Operators of Sulzer RTA "-8 and -2 Series" Engines

CRACKS IN COLUMN



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1. INTRODUCTION

Occasionally some cases of cracks have been reported on the columns of RTA "-8 Series" and RTA "-2 Series" engines. This Service Bulletin informs about the possible location of such cracks in the column and how to apply preventive measures to the respective unit.

The RTA "-8 Series" comprises the following engine types in this Service Bulletin:

RTA 58, RTA 68, RTA 76 and RTA 84

The RTA "-2 Series" comprises the following engine types in this Service Bulletin:

RTA 52, RTA 62, RTA 72 and RTA 84M

Wärtsilä NSD Switzerland Ltd together with the engine builders concerned have investigated the likely causes for the occurrence of cracks in columns and have looked at the problem from various angles such as design, manufacturing and also operational aspects. Numerous strain gauge measurements were performed as well.

During gouging of such cracks often shortcomings were found such as:

- Incorrect plate edge preparation
- Welding root faults; lack of penetration
- Small non-penetration on the welding corners; sharp edge corner of cross head guide plate; not ground out according to the drawing or welding and quality specification

This Service Bulletin should be kept in a separate file in the control room. The respective pages or tables of the Service Bulletin with modifications to the Operating Manual, Maintenance Manual or Code Book should be copied and filed in the respective Manual or Book.

2. DESIGN ASPECTS

The principle of the design of welded structures for Sulzer RTA engines is to combine the highest rigidity with a low weight. Hence, stiff box-type elements are used for the column walls rather than open structures with many stiffening ribs.

3. MANUFACTURING ASPECTS

The corners where such cracking has happened on RTA engines have been machined and / or welded under control of the common manufacturing specifications which have been applied during all the years of manufacturing RND, RND..M, RL and RTA engines.

4. OPERATIONAL ASPECTS
(Abnormal Acting Forces)

Although it is not so clear that a relationship between abnormal acting forces and cracks exists, the following influences, based on observations, cannot be entirely excluded:

- Increase of alternating torque due to e.g. mis-firing
- Increase of column vibration due to mal-functioning of lateral fixation, balancers and / or dampers
- Abnormal forces originating from mis-assembly (torque) of jack bolts and / or tie rods

5. COUNTERMEASURES FOR ENGINES IN SERVICE

It is difficult to assess and pin-point the exact reasons leading to this cracking phenomenon. In order to overcome all these negative factors, we adopted for the latest engine types (C-, U- and T- series) the affected areas to get the full benefit of the safety margin due to easier manufacturing procedures (welding and plate preparation). These aspects have also been considered and applied for the repair procedures.

5.1. Preventive Inspections

In order to avoid expensive repairs, we ask you to inspect the crankcase on a regular basis.

In all cases where cracks are found, their propagation should be regularly checked and reported. The extent of a crack has to be confirmed by, e.g. dye-check method and has to be marked with a centre punch. For a corresponding report, our standardized record sheet which is attached to this Service Bulletin should be used, and the position and situation have to be sketched and described.

Preventive measures have to be applied, preferably to all units, and of course the repair of the crack(s), as soon as the vessel's schedule permits.

5.2. Location of Cracks

The positions of the column cracks are not in a clear correlation to cylinder numbers and port / starboard side of the engine.

The cracks have been found mainly:

- In the corner of the cross beam for the thrust bolts and the guide plate (rail) [RTA 84, RTA 62, RTA 84M] Fig. 1
- In the welding seam between stiffening rib and guide plate (rail) [RTA 62, RTA 72, RTA 84M] Fig. 2
- In the welding seam between guide plate (rail) and transverse plate [RTA 76, RTA 84] Fig. 3
- In the vertical weld of the guide plate / middle plate on the gear column [RTA 76, RTA 84, RTA 84M, RTA 62, RTA 72] Fig. 4

5.3. Countermeasures for Engines in Service until a Repair is possible

5.3.1. In the Case of Cracks in the Corner of the Cross Beam

- A repair can be scheduled for the next drydocking or long loading / discharging period However, the engine must be immobilized for the repair purpose.
- The VIT must be deactivated
- Normally no restrictions for load or speed

5.3.2. In the Case of Cracks in the Stiffening Rib and Guide Plate

- Crack in the vertical welding seam must be repaired as soon as possible otherwise a crack propagation towards the transverse plate will occur
- The VIT must be deactivated
- Normally no restrictions for load or speed
- Condition of the guide shoes whitemetal layer must be inspected more frequently

5.3.3. In the Case of Cracks in the Guide Plate and Transverse Plate

- Crack in the welding seam must be repaired as soon as possible
  Negative running clearances between the guide shoe and unloaded guide rail due to expanded open crack
- The VIT must be deactivated
- Normally no restrictions for load or speed
- Condition of the guide shoes whitemetal layer must be inspected more frequently

5.3.4. In the Case of Cracks in the Vertical Weld of the Guide Plate / Middle Plate (Gear Column)

- Crack in the welding seam must be repaired very urgently
  ATTENTION! Danger of break down of the gear train
- Restriction of power and speed must be considered

5.4. Crack at the Corner of the Cross Beam (Fig. 1)

Cracks were observed in the corner of the cross beam for the thrust bolts and the guide plates.

If a crack is found in the corner of the cross beam for the thrust bolts and the guide plate, it is advisable to plan a repair and observe the cracked area closely, to prevent further damage (extension of crack) to the guide plate / cross beam area.

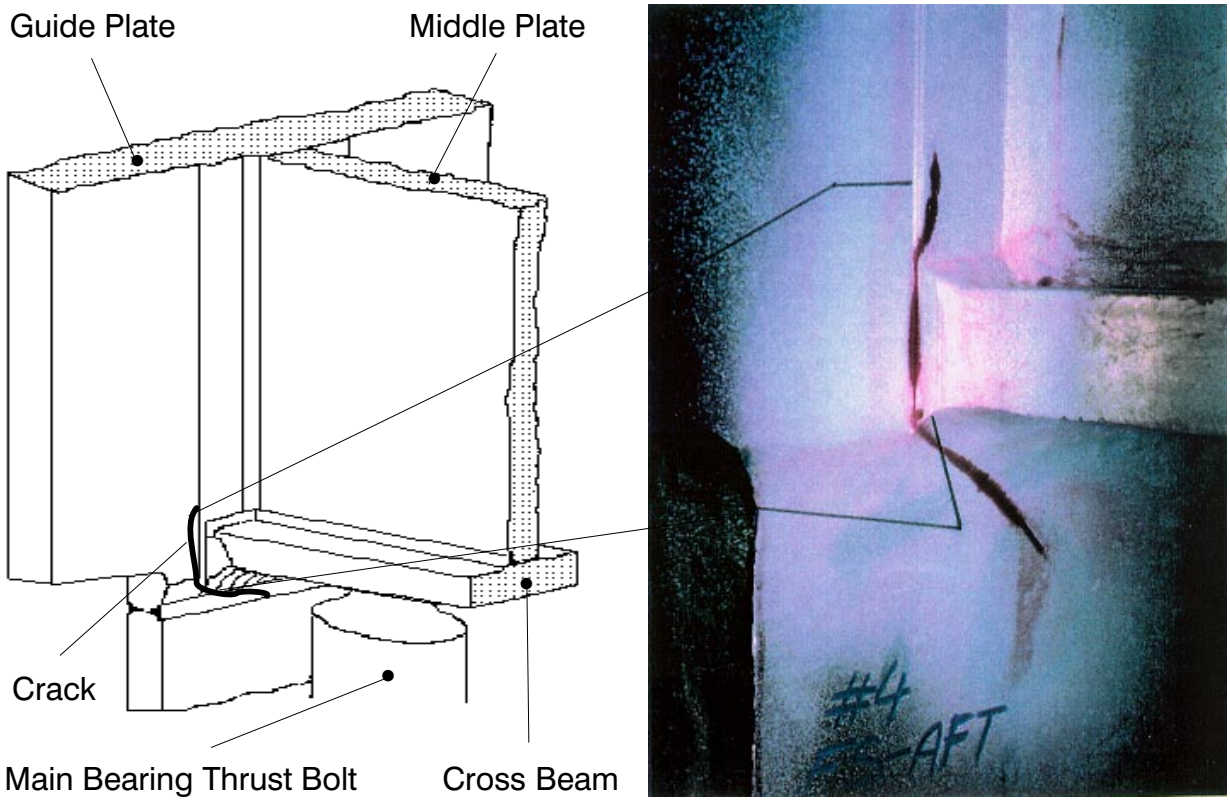


Fig. 1 Crack in the Corner of the Cross Beam

5.5. Crack at the Stiffening Rib and Guide Plate (Fig. 2 on page 4)

Cracks could appear in the welding seam between the stiffening rib and the guide plate. However, this could only happen on the previous execution were the stiffening rib is still welded to the guide plate.

A crack in the welding seam between the stiffening rib and the guide plate would also lead gradually to a reduction in the clearance for the crosshead guide shoes, causing damage to the whitemetal layer of the crosshead guide shoes.

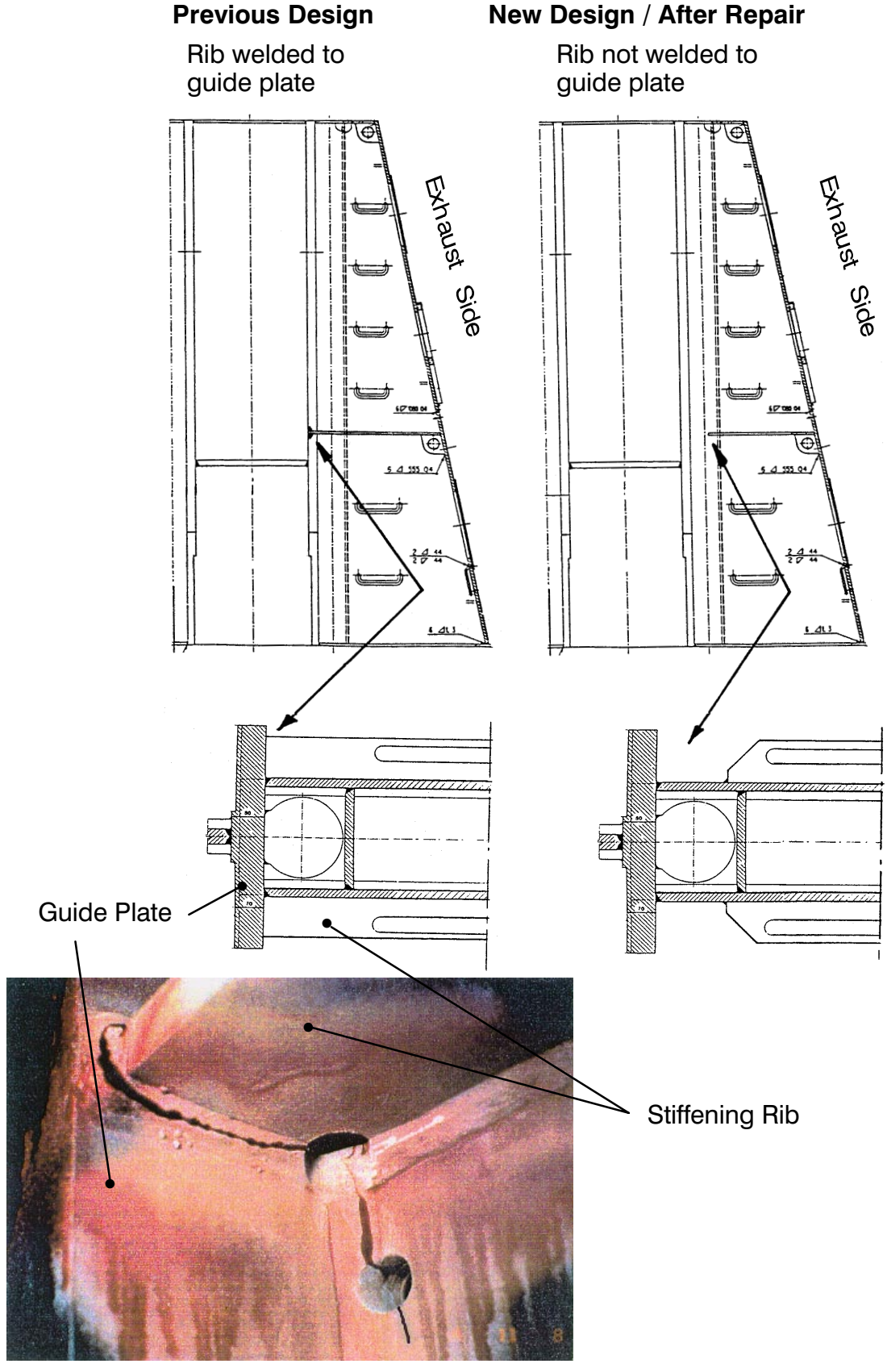


Fig. 2 Crack in the Welding Seam between Stiffening Rib and Guide Plate

5.6. Crack at the Guide Plate and Transverse Plate (Fig. 3)

On some of the RTA "-8 Series " engines, vertical cracks in the welding seam between the guide plate and the transverse plate could be found. This is a serious case and should be repaired as soon as possible.

A vertical crack in the welding seam between the guide plate and the transverse plate would also lead gradually to a reduction in the clearance for the crosshead guide shoes, causing damage to the whitemetal layer of the crosshead guide shoes.

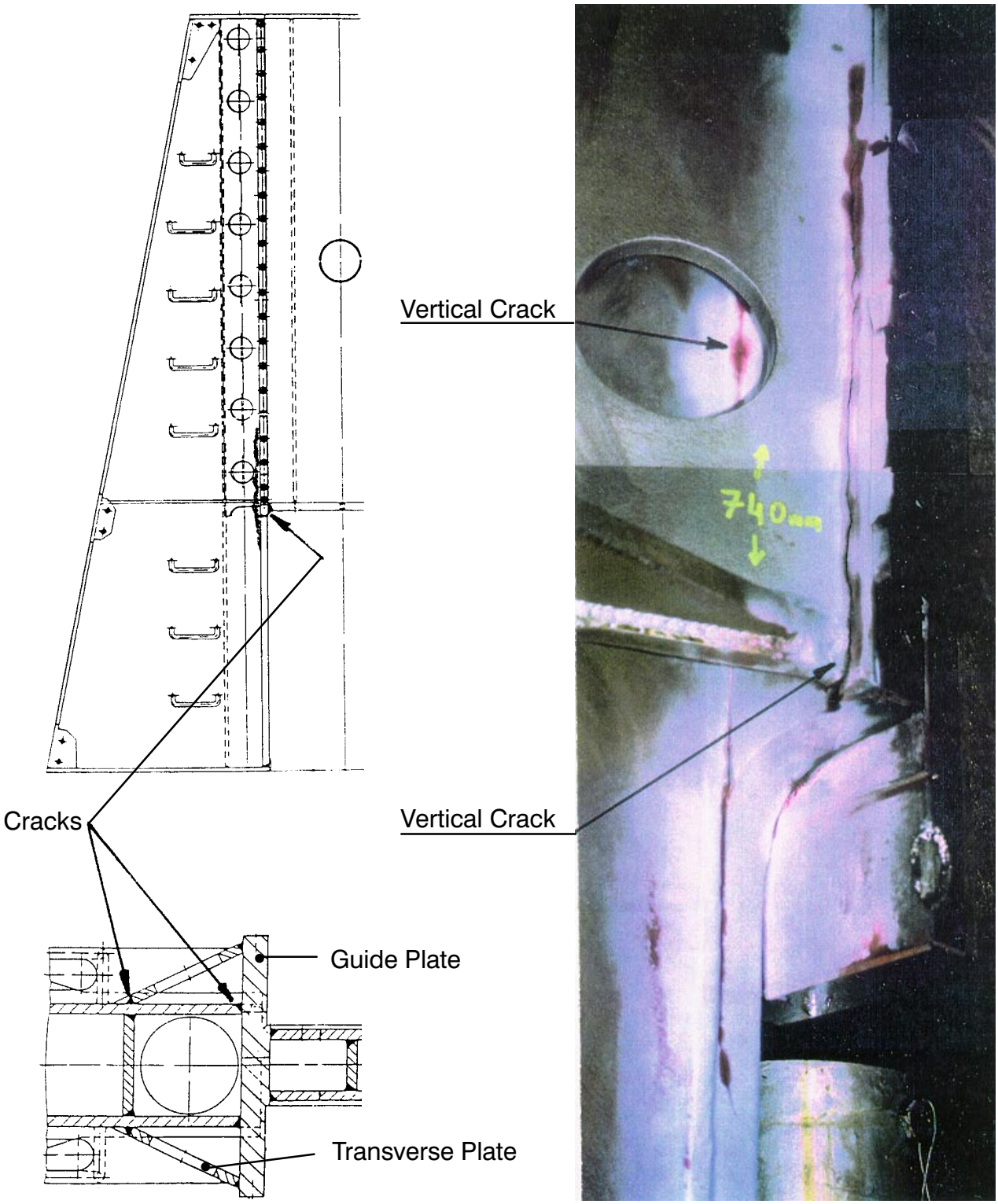


Fig. 3 Vertical Cracks in the Welding Seam between Guide Plate and Transverse Plate

5.7. Crack at the Gear Column (Fig. 4)

Cracks were observed in the vertical weld of the guide plate / middle plate in the gear column. If the crack is far extended the gear wheels will show heavy overload pittings.

In this case an urgent repair is needed otherwise there is a danger of breakdown of the gear train.

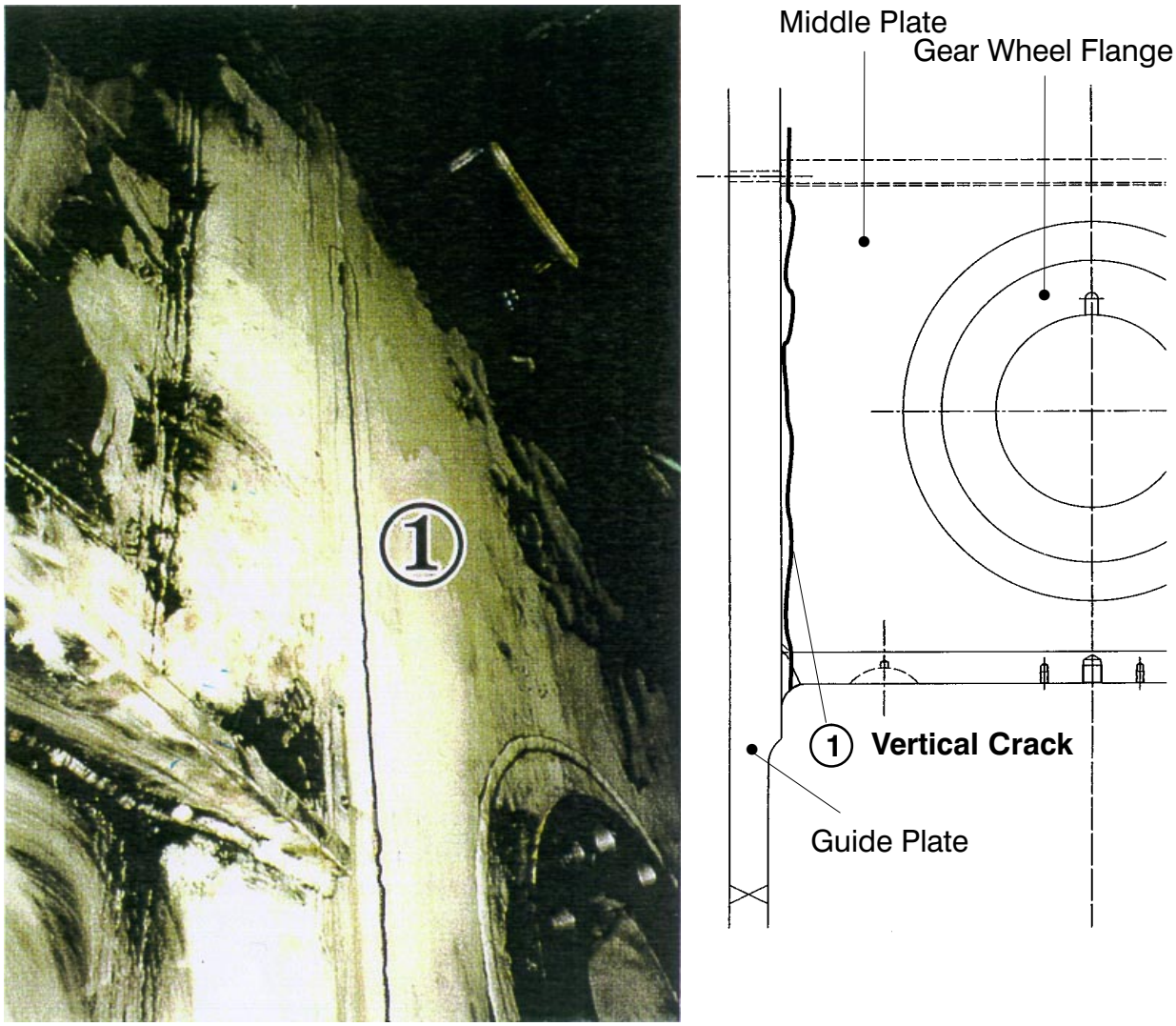


Fig. 4 Crack in the Gear Column

6. REPAIR SOLUTIONS

6.1. Repair on the Cross Beam of Monoblock Column (Ear Solution)

- Removing of the crack by cutting out the affected area, grinding and weld stiffening ribs (Ear Solution, Fig. 5).

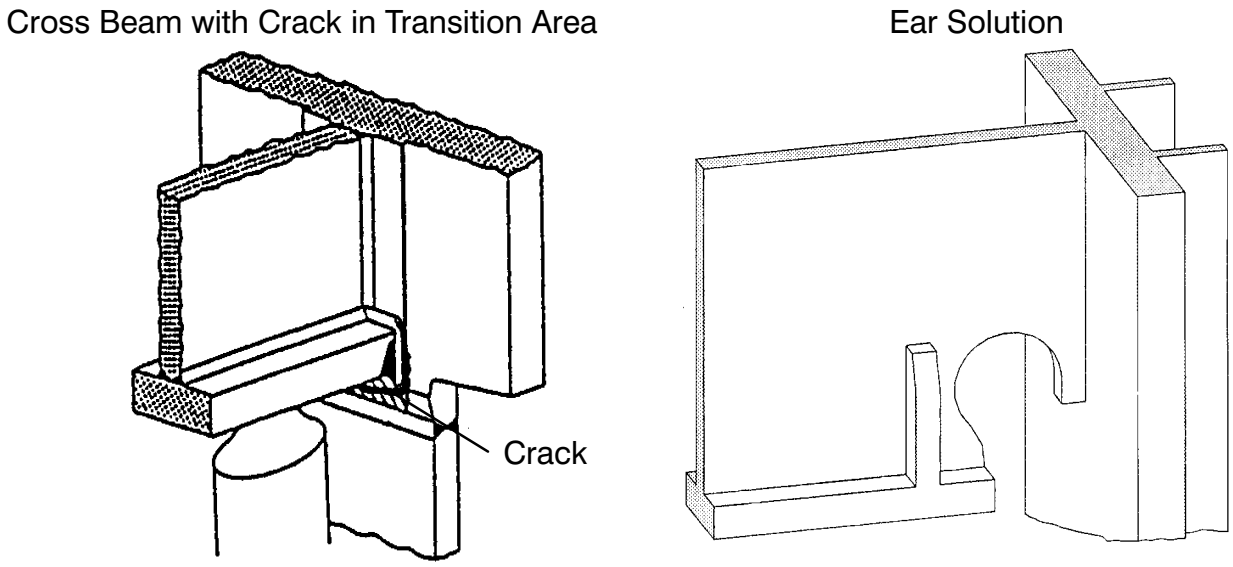


Fig. 5 Ear Solution Repair

6.2. Repair on the Stiffening Rib

These repair method will prevent the crack propagation to the transversal plate.

- Stiffening rib to the guide plate stop hole to be drilled (only temporary solution Fig. 6).
- Stiffening rib to be shortened (Fig. 6).

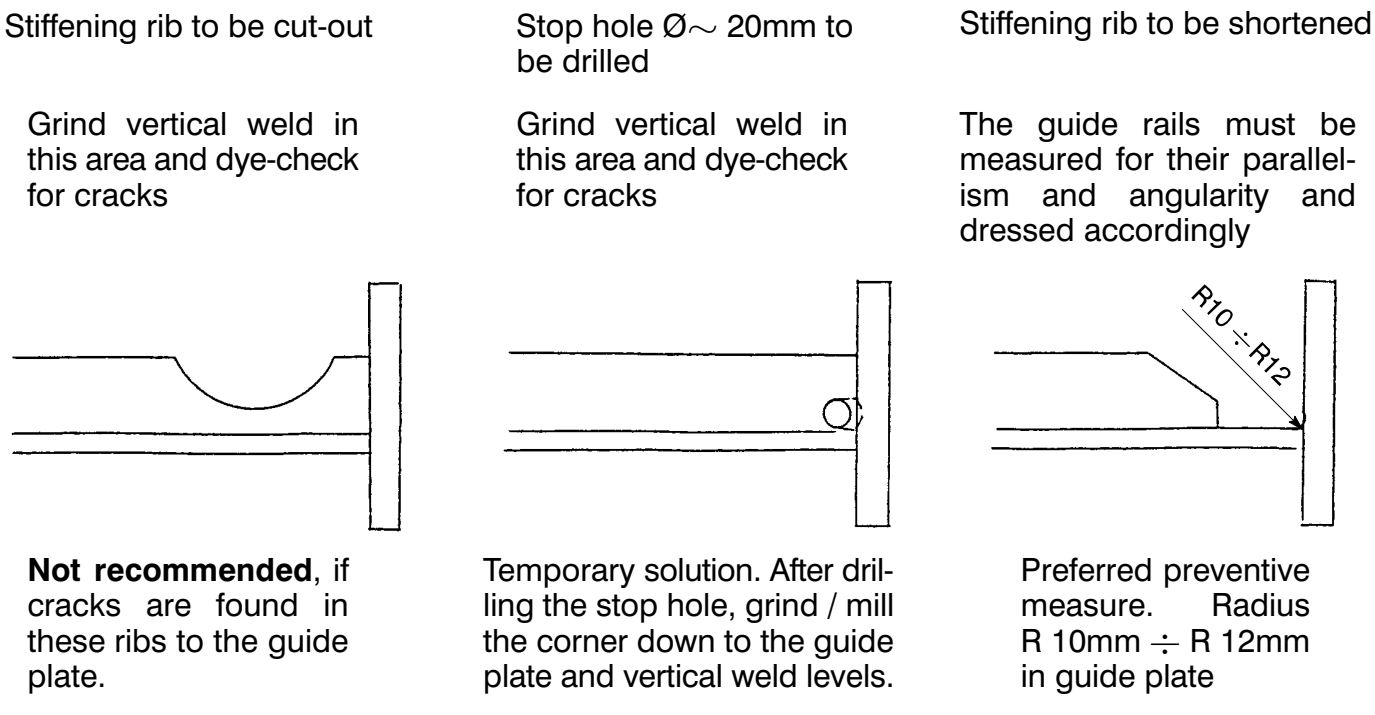


Fig. 6 Repair Methods on the Stiffening Rib

6.3. Extended Repair on Single A-Frame and Monoblock Column

6.3.1. Renewal of Cross Beam

- Removal and renewal of cross beam in order to have sufficient access for complete elimination of the crack(s). Welding in two additional stiffening ribs to the guide plates and the cross beam. The ribs are located between the two middle plates (Ear Solution, Fig. 7).

Note: ***No stop holes should be drilled at the end of cracks, to avoid an even more expensive repair.***

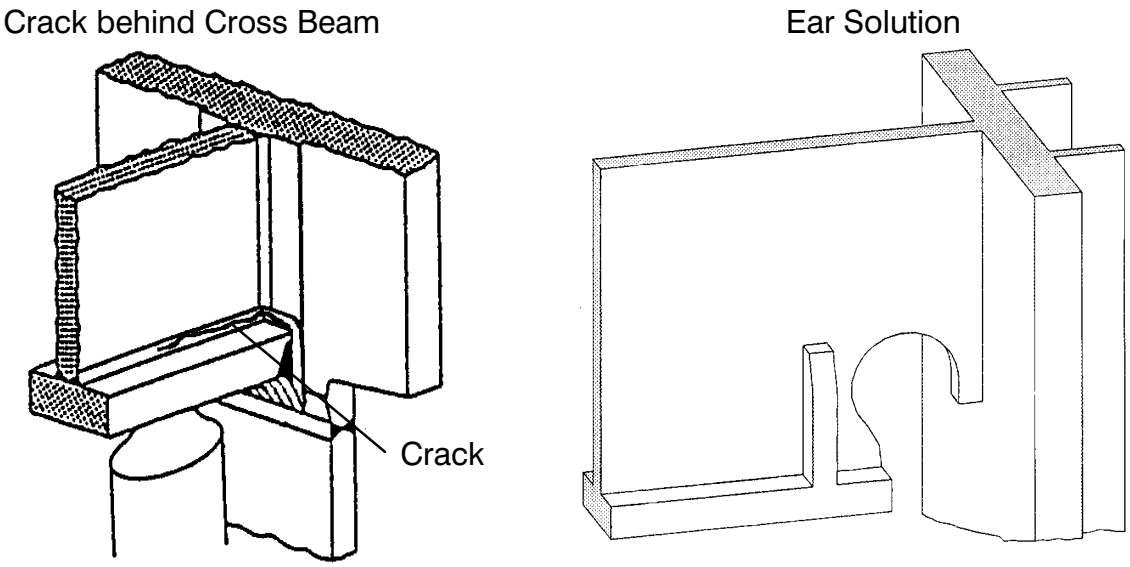


Fig. 7 Ear Solution Repair

6.3.2. Repair on Gear Column

This is a rather complicated and time consuming repair. Each case must be carefully inspected and an individual repair procedure plan must be made.

If the repair is not carefully carried out, especially the correct welding sequence, heavy distortion can be expected.

7. CONCLUSION

We suggest that one of our service engineers from **Wärtsilä NSD Switzerland Ltd or any of our Network Companies** assist you when the repair is carried out.

8. SERVICE BULLETINS PUBLISHED FOR LARGE BORE RTA−TYPE ENGINES

We have so far published the following Service Bulletins which are valid for Large Bore RTA−Type Engines (RTA 48T to RTA 96C):

RTA−1	dated 01.03.88	**Recommendation Concerning Piston Running Behaviour**
RTA−2	dated 05.10.88	**Water Drain from Charge Air Receiver and Charge Air Temperature**
RTA−3.4	dated 30.03.98	**Fuel Injection Nozzles**
RTA−4	dated 20.11.89	**Oil Damping for Short Tie Rods**
RTA−8	dated 15.06.92	**RTA−Cylinder Liners and Reinforced Water Guide Jackets**
RTA−9	dated 20.07.92	**Cylinder Cover with Erosion / Corrosion Resistant Cladding**
RTA−10	dated 28.10.92	**RTA "−8 Series" Engines / Piston Skirt in Two Parts**
RTA−11	dated 31.03.93	**Fuel Injection Pump Regulating Linkage**
RTA−14	dated 30.11.93	**System Oil Care and Maintenance**
RTA−15	dated 10.02.94	**Elastic Studs on RTA-Type Engines**
RTA−16.1	dated 20.02.98	**Retrofit for Piston Rod Stuffing Boxes for RTA "-8 Series" Engines**
RTA−17.1	dated 28.02.95	**Circulation Valve to Fuel Injection Valve**
RTA−18.1	dated 27.08.98	**Running-in of Cylinder Liners and Piston Rings**
RTA−19	dated 28.10.94	**Oil Supply Monitoring for Geislinger Torsional Vibration Damper**
RTA−20	dated 30.11.94	**Rotational Safety Studs for Roller Guide of Fuel Pump and Exhaust Valve Actuator**
RTA−21	dated 10.04.95	**Improvement of Starting Behaviour (For engines with DENIS−1 and DENIS−5 Control Systems only!)**
RTA−22.1	dated 28.11.96	**Waisted Bolts for Piston Crown Spraying Plate of RTA 84C, 84CU, 84M and 84T Type Engines**
RTA−24.2	dated 18.05.99	**VTR..4 Turbochargers After Sales Service Information issued by ABB**
RTA−26	dated 03.01.96	**Loss of Material on Piston Crowns due to High Temperature Corrosion and Erosion (Watercooled Pistons)**
RTA−27	dated 26.04.96	**Plastic Water Separator**
RTA−28	dated 31.05.96	**Improvement of the Engine Control System**
RTA−29	dated 21.10.96	**Improved Oil Supply to the Integrated Axial Detuner equipped with Internal Oil Supply Line**
RTA−30	dated 27.11.96	**Improvement of starting behaviour on RTA engines equipped with Type PGA200 and PGA EG200 Woodward Governors**
RTA−31	dated 23.01.97	**Alphabetical Index of Topics of Service Bulletins**
RTA−33	dated 11.04.97	**Crank Pin Bearing Shell**
RTA−34	dated 28.11.97	**Fuel Injection System Modification and Maintenance**
RTA−35	dated 20.02.98	**Retrofit for Piston Rod Stuffing Boxes for RTA "-2 Series" Engines**
RTA−36	dated 25.02.98	**Reconditioning of Piston Rods of RTA "-2 Series" Engines**
RTA−37	dated 25.02.98	**Reconditioning of Piston Rods of RTA "-8 Series" Engines**
RTA−38	dated 26.02.98	**Piston Crown Loss of Material on Combustion Side**
RTA−39	dated 31.03.98	**Overhaul and Reconditioning of Pistons**
RTA−42	dated 25.09.98	**Templates for Exhaust Valve Seat and Spindle**
RTA−43	dated 20.01.99	**Piston Rings**
RTA−44	dated 26.02.99	**Tightening Instructions for Plunger Guide Nipple**
RTA−45	dated 18.06.99	**Tightening Instructions for Screws and Waisted Studs**
RTA−46	dated 17.06.99	**Cracks in Column**

Should you not be in possession of the above mentioned documentation suitable for your plant, kindly contact your local Wärtsilä NSD representative for your copy.

Enclosure: as mentioned in text

WÄRTSILÄ NSD CORPORATION

SULZER **RTA Engines**

Record Sheet 1

for cracks found on column
to be marked accordingly

Engine T pe **RTA**

Engine Nr.

Engine Builder

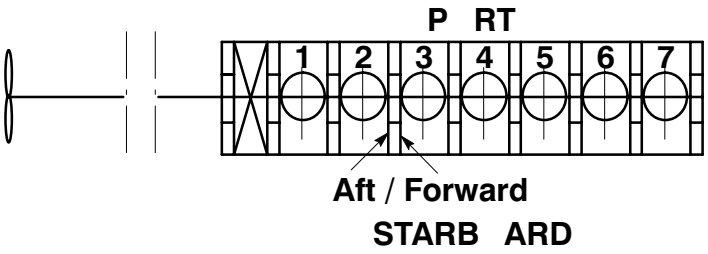
Name of Vessel

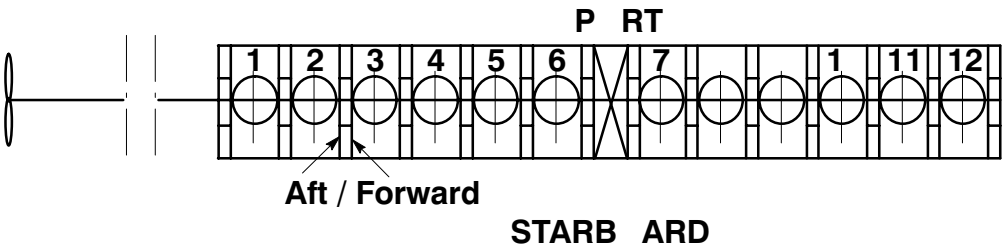
Total Running hrs.

C linder Nr.

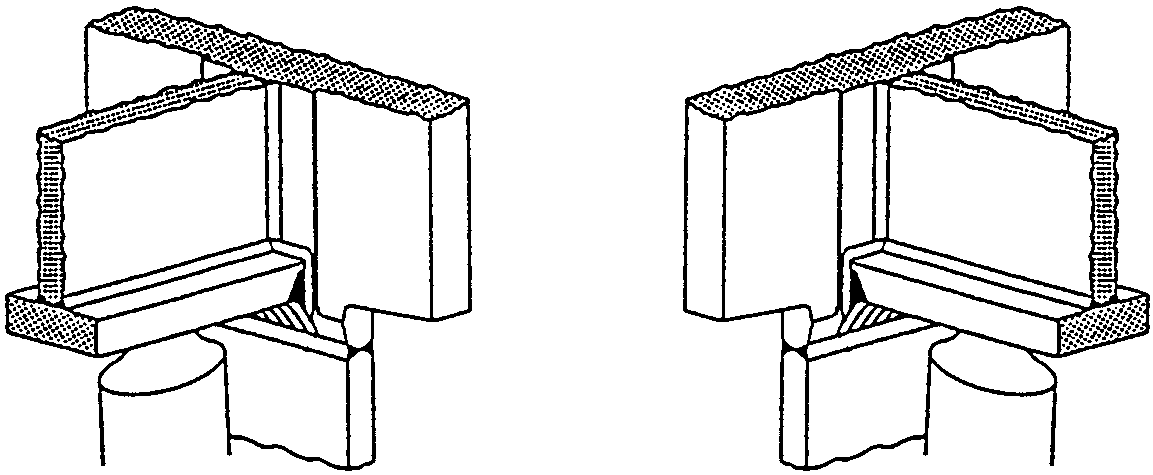
Forw. **P** **RT** **STARB**

Aft **P** **RT** **STARB**

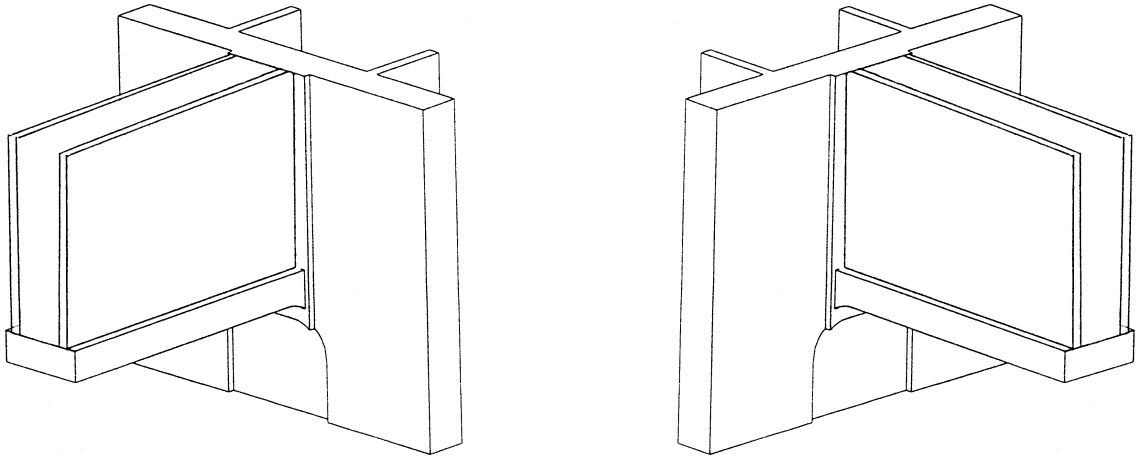




Crack in the Corner of the Cross Beam Monoblock Column



Crack in the Corner of the Cross Beam Single A Frame Column



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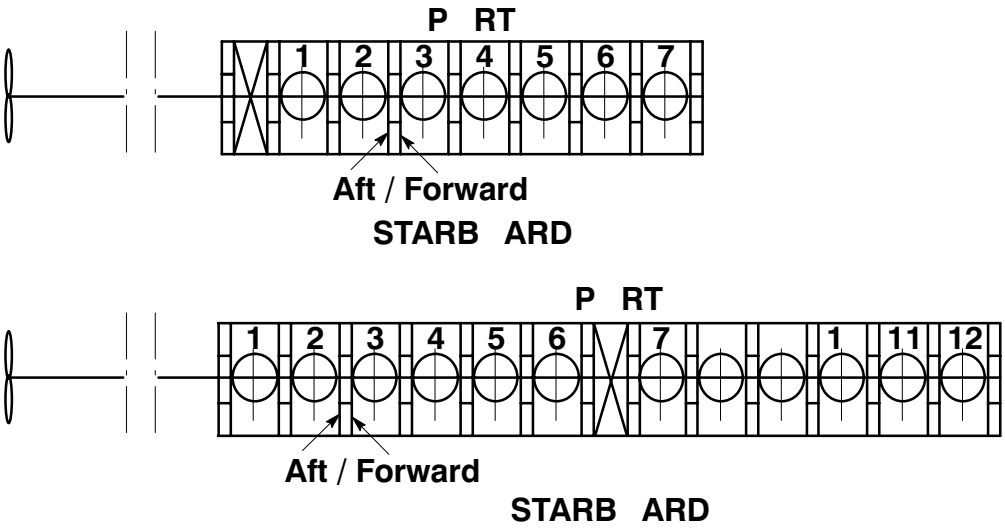
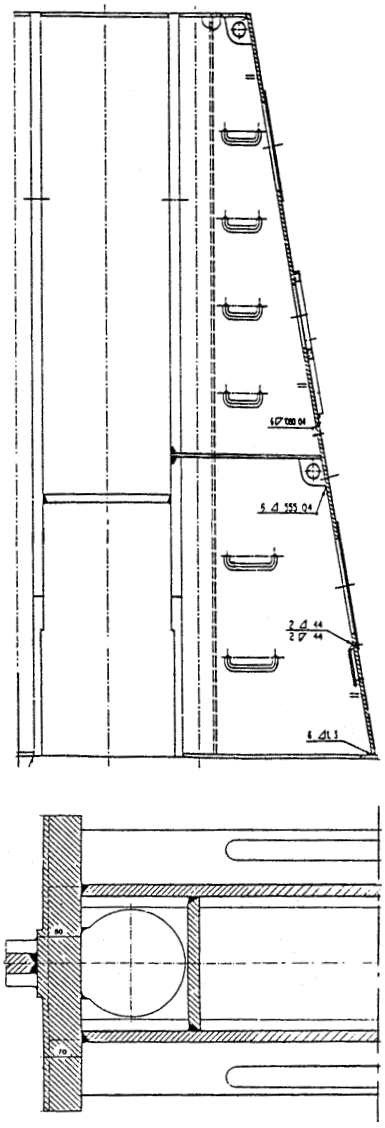
SULZER **RTA Engines**

Record Sheet 2

for cracks found on column
to be marked accordingly



Crack in the Stiffening Rib



Crack between Guide Plate and Transverse Plate