

# Radio Astronomy Centre

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12/2/97

7th. FEB. 1997.

THE DIRECTOR, N. C. R. A.  
PUNE.

DEAR PROF. KAPAHI,

I AM HERE WITH ENCLOSING THE 27-YEAR MECHANICAL REPORT OF THE OOTY RADIO TELESCOPE FOR YOUR REFERENCE. THIS REPORT WAS PREPARED BASED ON THE RECORDS AVAILABLE WITH ME. THIS REPORT IS UPTODATE ONE AND IS UPTO DEC. 96. FURTHER I WILL SUBMIT EVERY, YEARLY REPORT FOR YOUR REFERENCE.



YOURS SINCERELY  
(S.M. LOUIS).

C. C. :- 1) PROF. G. SWARUP, PROF. EMERITUS. N. C. R. A. PUNE.

2) THE HEAD, R. A. C. OOTY.

3) THE DEAN, N. C. R. A. PUNE.

4) THE PROJECT MANAGER, N. C. R. A. PUNE.

5) MR. M. K. BHASKARAN, MECHANICAL ENGINEER, PUNE.

6) MR. N. V. NAGARATHNAM, ELECTRICAL ENGINEER, PUNE.

**27 YEAR-REPORT  
OF O.R.T.**

**(MECHANICAL)**

*1969 TO 1996*

(UPTO DATE REPORT)

*31-DEC-96*

S.M.LOUIS  
ENGINEER 'SD'  
RAC,OOTY

27. YEAR'S REPORT OF O.R.T.

(1969 TO 1996)

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During 1969 the main work was to correct the Telescope's RADIAL GAPS to Keep Min.1mm. to Max.6mm. We have almost corrected from N12 to S12 all the Pinsectors by removing the shims or adding the shims. All the other routine works like oil filling in the Gearboxes, Greasing the Bearings, Alignment and servicing the Clutches were carried out. Also the measurements like 10" Flexible coupling gaps, Center column square bush and shaft gaps, 10" A.C. BRAKE plunger gaps and "Q" HIGHTS were taken recorded.

In 1969 the 1st. Telescope Drive System designed by M/S.T.C.E. was a very simple one. All the drive pipes (4" Dia.) were welded with just a square bush at the end of the pipes. These pipes were coupled with a bearing shaft with square ends on both sides to suit the square bushes. The square bush and the shaft were having 1/4" Dia. holes in which a long M.S. Split pin in 1st. stage/Bolt&Nut-IIND. Stage were fixed. The chain Drive was a simplex chain drive (Diamond chain -U.S.A.) with sprockets. Most of the Drive pipes were having BEND while it was transported from Calcutta to OOTY. Because of the bend, during rotation the center column "A" Fram Towers and corresponding Telescope Brackets used to wobble and twist. Because of the twist the 1/4" dia. Bolts in almost all the square joints in the drive pipe used to shear and also the frequency of breaking was more.

So decided to weld the square bush and the square shaft in all the center columns. The welding was carried out from N12 onwards and completed up to S3. Due to some Observation the welding was stopped for some days. On 8Th. December 1971. there was a major accident taken place in the Telescope Drive system.

The 530 Mtrs. long drive system got DE-COUPLED between S4 & S5. Center Column. The S4 South shaft end (With square bush) came out from the "A" Fram Bearing square shaft at the center column. (This center column also used to wobble like other center columns. But how this happened Nobody able to give correct Answer.

The Ist. Drive System which was Designed by T.C.E. was having, only Flexible couplings, Square Shafts and Square Bushes. The Feed Trusses were bolted with each other. [There is no proper sliding to North and South]

In the II Ind. time in 1972 the entire drive system was modified and corrected so well by M/S. T.C.E. and NO PROBLEM was noticed except the TYPE "C" UNIVERSAL COUPLINGS at the Center Columns. Once this coupling body or bush wornout it use to give heavy hitting noise but there is no danger for the system. In Electrical lot of Safety Devices like Differencial Synchros, Speed Tachos and crush type Limit Switches were interduced. In Structural lot of areas (Weaker Sections) were strengthend.

#### I) MECHANICAL DRIVE SYSTEM

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- 1) During the Modification we have interduced New Devices like TYPE "C" COUPLINGS, TYPE "D" COUPLINGS, RIGID COUPLINGS, DUPLEX CHAIN DRIVES WITH IDLERS [ORIGINAL WAS SIMPLEX CHAIN DRIVE], NEW BRAKE DRUMS WITH 8/A. SHAFTS, FLEXIBLE COUPLINGS IN PLACE OF 8" BRAKE DRUM CUM COUPLINGS AND NEW 10" A.C. ELECTRO MAGNETIC BRAKES.
- 2) Regarding Structural part of it we have STRENGTHENED the Center Column Towers, All the Tower BRACKETS, New END CONNECTIONS with proper SLIDING ARRENGEMENTS for FEED TRUSS was welded and all the MISSING CROSS ANGLS were welded at the FEED TOWER NECK PORTIONS.
- 3) All the SAFETY DEVICES were fixed in the TELESCOPE like OVER SPEED TACHOS, DIFFERENCIAL SYNCHORS and Additional LIMIT SWITCHES. [MISALIGNMENT LOOPS (MA/I & MA/II) was already EXISTING]

ALL THE ABOVE MODIFICATION WERE CARRIED OUT UNDER THE GUIDANCE OF T.C.E. ENGINEERS MESSERS. A.D. GOKHALE and R.P. MAHAJAN.

To brief the above MAJOR MODIFICATIONS in the TELESCOPE

I have enclosed one of the REPORT prepared by Mr. M.K. BHASKARAN in Dec. 1973 which was sent, to Prof. G. SWARUP.

## II) FOLLOWING ARE THE IMPORTANT PREVENTIVE / BREAK DOWN WORKS.

## A. IMPORTANT WORKS CARRIED OUT

1. S3.TOWER :-In 1969 The 36:1 Gear Box gear slipping was seen by Mr.S.ANANTHAKRISHNAN (Presently The DEAN, N.C.R.A.) while the Telescope was moving to East.This particular tower instead of going up it started slipping down.[Luckely he was around that area] Immediatly the Telescope was stopped.The O.R.T.was brought to StowLock and locked.The 36:1 Gear Box was brought down and the spare Gear Box was fixed.The defective gear box was sent to M/S. New Allenbery Works,Calcutta.
2. N10,N4,S4&S10:-[6/76] The slew motor Flex.couplings renewed with New Allenbery flex.couplings.
3. 10"A.C.BRAKES:-[8/76] The telescope started slipping 12to15sec. after stopping the Telescope.So all the brakes plunger gaps and spring lengths adjusted .
4. WELDING CHECK UP:-The welding check up of the telescope frames carried out from N12toS12.
5. PIVOT SHAFT BEARING:-[11/76] The pivot shaft bearings checked and regreased.
6. 175KVA.DIESEL GEN.SET:-The generator set service carried out.
7. RADIAL GAP MEASUREMENTS:-The telescope radial gap measure ments taken.
8. S.S.WIRE:-[1/77] The reflector wires corrected 8nos.  
[540-560]from N12toS12.
9. END CONNECTIONS:-All the end connections greased .
10. N12&S12:-[2/77] The counter weight concrete blocks cut and removed.
11. THE 19/57 TEETH DUPLEX SPROCKET:-[3/77] The alignment of these sprockets done at N11-3mm,N10-4mm&N4-4mm.
12. 19MM GUY ROPES:-From N12toS12 greased.[SURROT-30].
13. 36:1GEAR BOX:-[5/77] All gear box bearings greased.

14. 14MM GUY ROPES:-From N12toS12 greased.
15. O.R.T. PAINTING:- N12toS12 Painting completed.
16. S.S.WIRE:-1000to1100/ 10Nos. Corrected.
17. 5:1&5:3 GEAR BOXES:-In servo these gear boxes found defective  
So old Track System restored.
18. DRIVE PINSECTOR COTTER PINS:-The following pinsector cotter pins  
welding got cut and there was a slight ply in the pin [North-South]  
and it was re welded. [N1-120, N3-168, N6-150, S1-84, 86&88, N10-180,  
N8-181, S4-21, 43, 59&80&S2-50.
19. 4"dia. Driveshaft bearings:-[12/77] Annual checking of Bearings  
done from N12toS12
20. O.R.T. PAINTING complete in May 1979.
21. 14MM GUY ROPES greasing completed in May 79.
22. ANNUAL CHECKING of 4" Dia. Drive shaft bearings done N12toN4.
23. S.S.WIRES from N12toS2 corrected. [10/79]
24. DRIVE SHAFT BEARINGS N12toS12 cleaned, checked and re greased.
25. S.S.WIRES from strip no. 3to16 corrected. 31 new wires stretched  
from S1to S12.
26. O.R.T. WELDING check up of frames carried out. [1/80]
27. ANNUAL CHECKING of Pivot shaft bearings done. [2/81]
28. DURING O.R.T. PAINTING dye penetrant test at critical welding  
areas carried out. [5/81]
29. All THE GEAR BOXES oil level checked. [9/81]
30. ANNUAL CHECKING of drive shaft bearings done. [2/82]
31. O.R.T. RADIAL GAP measurements taken. [6/82]
32. O.R.T. PAINTING completed in April/83.
33. WELDING CHECK UP of critical points carried out from N1 to N12.  
S1toS3. and S10to S12.
34. IN 1/84 AND FROM 9.1.84. to 24.1.84. S.S. Wires were stretched. About  
45 wires of full length and 150 nos. of part wires stretched.

35. IN 3/84. RADIAL GAP MEASUREMENTS taken by Prof.G.S.,Dr.S.A.K.,Dr.V.B, M.K.B.,H.S.K.,N.V.N.and S.M.L. AND also 24 frames thoroughly checked.
36. IN 4/85.CRITICAL WELDING POINTS at counter weight checked.Annual checking of Pivot shaft bearings carried out.
37. IN 7/85.ANNUAL CHECKING of drive shaft bearings done.
38. IN 8/85.CRITICAL WELDINGS in the O.R.T. checked.
39. IN 8/85.O.R.T. TRUSS and END CONNECTIONS greased.
40. IN 9/85.During the visit of T.C.E. Engineers 12 frames radial gap measurements taken.
41. IN 2/86. THE PAINT EXPERT Mr.POTNIS visited Ooty on 10.2.86. and checked the O.R.T.Paintings.
42. IN 3/86.CRITICAL WELDING check up done in the O.R.T.
43. IN 2/87.CRITICAL WELDING check up done in the O.R.T.
44. IN 9/87.S.S.WIRE CORRECTIONS carried out from N12to N1. 10 TO 12 Wires corrected.
45. IN 1/88.O.R.T. DRIVE SHAFT BEARINGS from N12to S12 greased. During this process in N2 (north arm) and S3 (south arm) bearing housing bottom half found cracked. The same was changed.
46. In 2/88.O.R.T. PIVOT SHAFT BEARINGS greased from N12 to S12.
47. IN 3/88.O.R.T. M.A.1(EAST LOOP) The 's.s. wire found cut at S12. The same was changed with a new wire.
48. IN 3/88.O.R.T.PAINTING completed.
49. IN 2/89.NEW COPPER CLEATES brazed from N12 toS12. in all the S.S.LOOPS.(M.A-II)
50. IN 8/89. 10"D.C.BRAKES TORQUE test done.12 nos.Aligned for 86Ft.lbs.
51. IN 9/89.4NOS.OF D.C.Brakes installed from N1to N4.[86Ft.lbs.]
52. IN 10/89.'Q'- SCALE READINGS were taken and it is repeating with reference to the old readings.The total movements +/- 10to20 mm. [North-South].
53. IN 11/89. 4NOS.of D.C.BRAKES installed from S1to S4.



54. IN 1/90. S5toS8. 10" D.C.Brakes installed.
55. IN 2/90. IN N10,N4,S4&S10.The 9.6:1 Gear box with new internals installed [made at M/S.SHANTHI GEARS. COIMBATORE]
56. IN 12/91.THE RE-GREASING of drive shaft bearings completed from N12 to S12.
57. IN 9/95.AII 4"DIA.DRIVE SHAFT bearings checked and regreased from N12toS12.
58. O.R.T.STRUCTURAL welding check up for spot pittings carried out. In North 5 spots and in South 11 spots corrected by metal filling [Arc welding] to 1.5mm to 2mm. Also checked after one year [5/92].
59. 36:1 GEAR BOX input shaft BEARINGS CHANGED from N12 to S12.[5/92].
60. 92/95.EVERY YEAR RADIAL GAP Measurements are being taken. So far no major problems noticed.
61. IN S1.THE ENCODER fixed at South pivot shaft bearing.[3/95].
62. IN 4/94.THE O.R.T PAINTING Touch up carried out.
63. 3/95. TORSION of O.R.T. DRIVE SHAFT studied. from N12 to S12. [ Max.= 0 to 70 Deg. noted. Allowed by T.C.E. is 0 to 200 Deg.(70'S)]
64. IN 9/95. IN S2-S3.CENTER COLUMN the NEW GEAR COUPLING installed.
65. IN 3/96.THE M.A.I-EAST LOOP S.S.WIRE got cut and the same was corrected.
66. IN 11/96. IN N 7-6 CENTER COLUMN THE NEW GEAR COUPLING IS FIXED in place of TYPE"C" COUPLING.After trial run released for observation.
67. IN 12/96.S.S.WIRE CORRECTIONS FROM N12 TO N1 CARRIED OUT.

### III)MAJOR WORKES CARRIED OUT IN THE INDIVIDUAL TOWERS.

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1. N12 TOWER:- IN 6/77. The 19:57 Teeth Sprocket aligned to 4mm.
2. N11.TOWER:- IN 3/77.The 19:57 Teeth Sprocket aligned to 3mm.
3. N10.TOWER:-A)IN 3/77.The 19:57 Teeth Sprocket aligned to 4mm.  
B)IN 1/88.The counter weight top chord channel had sheared at the 2nd joint from the drive sector joint and the counter weight arm had moved and rested against

the drive sector.

C)In 7/88.The 9.6:1 Gear box out put sprocket was loose on the shaft.The same was changed with a spare gear box with new sprockets.

4)N9 TOWER:- NIL. [GENERAL MAINTENAECE CARRIED OUT].

5)N8 TOWER:- A)The Drive Sector No:-2 The "X" Gap was low even after shifting the Pinion. The sector No:-2 was slotted and moved south by 3.5mm. [ 12/85]

B)In 4/85.The rigid flange on the bearing shaft was loose. New flange fixed with a new S.K.F.Bearing.

6)N7 TOWER:- NIL. [GENERAL MAINTENANCE CARRIED OUT]

7)N6 TOWER:- NIL. [GENERAL MAINTENANCE CARRIED OUT]

8)N5 TOWER:-A)IN 1/80.The "Q" Point N - S.moved down by 17 mm. while erecting the Diode Phase Shifter. We found interference between adjacent channels. So N6 moved down by 10mm.and N5 moved down by 8.7mm.Both adjusted to 5mm.to accomadate diode phase shifters.Turnbuckles locked by wire.No slipping of bulldog clamps noticed.

B)IN 2/96.THE PLATFORM SOUTH DRIVE SHAFT BEARING SOUND. Found the bearing spacer got cut and the spacer was replaced with new one.

9)N4 TOWER:- A)IN 3/77.The 19:57 Teeth sprockets aligned to 4mm.

B)IN 7/77.The 8A.Shaft brake drum was loose on the shaft.Replaced with a new Set.

C)IN 5/89.The 9.6:1 Gear Box out put shaft sheared. Replaced with a spare shaft.

D)IN 2/83.Weld cracks were noted in the drive sector cross brazing.The same was welded and corrected.

E)IN 12/84.The supply cable going to N4 brake got burnet.The same was changed.

10)N3 TOWER:-NIL.[GENERAL MAINTENANCE CARRIED OUT]

11)N2 TOWER:-A)IN 12/85.The drive sector No:-7 was slotted and moved south by 7mm.and pinion moved south by 3mm.

B)IN1/88.The North arm drive shaft bearing bottom housing found cracked.The housing was changed with a new housing.

C)IN 12/89.The 10"D.C.Brake found delay in engaging and could not rotate the Telescope.The coil was replaced with a new one.

12)N1 TOWER:-A)IN 8/77.The 19 teeth sprocket[Main drive shaft] moved north by 3mm.The same was corrected.

B)IN 2/83.The drive sector brazing angle weld cracks noted.The same was welded and corrected properly.

C)IN 2/88.At 25th.Pin the drive sector brazing angle touched the east limit switch and Antenna stopped. The 19mm. Guyrope at south found little loose and the drive sector moved north and "X" became zero. and "Y"became 20mm.The 19 mm.south turnbuckle was turned one round [Tightning] and north turnbuckle one round loosened.The sector moved south and the "X"= 5mm. and "Y"=15mm.Antenna rotated twice west to east for checking the line of rotation.No problem.

13)SERVO:- A)IN 5/76.The S.C.1150 Common Clutch was loose on the 250:1Gear box out put shaft.Metal filled all around the shaft and fixed tightly.

B)DURING 11/76, 6/77, 9/77,1/80,12/84,9/93&10/95 The Common clutch service[cleaning the friction and driving discs] carried out.Assembled the parts back and aligned the air gap to 24 thou].

C)IN12/77.The new servo system with braking duplex gear wheel and S.C.550 Clutch fixed.For scan instead of

S.C.450 Clutch flexible coupling fixed.In 6/77.The 5:1&5:3 gear boxes found defective and old track system restored.

D)IN 1/93.The 250:1 gear box input shaft bearings 2nos. re placed with new bearings.

E)IN 8/96.The SERVO OVER SPEED TACHO'S GEAR BOX input-shaft found sheared.The gear box was brought to work shop and dismantled.New shaft machined and all the bearings replaced with new bearings.Assembled the gear box and fixed at servo.No problem and running smoothly.

14)S1 TOWER:-A)IN 7/77.The 10"Brake re aligned and slided to west by 1.5mm.

B)IN9/82.The North arm drive shaft problem.It was found a small hole and a hair line crack on the drive shaft towards the north arm rigid flange side. This was filled with welding metal and being watched constantly.In 10/82.the crack had developed to about 180 degrees.Hence a new shaft with stub shaft on one side and rigid flange on the other side were welded. The new shaft was erected and was O.Kay.[Again in 9/96.in the same place the E.N.9 Stub shaft sheared between north arm bearing and at the edge of the south side rigid flange].

C)THE Na. E.N.9.BEARING STUB SHAFT FOUND SHEARED.

while the O.R.T.in TRACK MODE.[-01-30 Hrs.] The drive shafts were brought to work shop and NEW SHAFT machined and welded with the drive pipe.Assembled and fixed in the drive system.

15)S2 TOWER:- NIL.

16)S3 TOWER:-A)In /96.THE 36:1GEAR BOX GEAR SLIP NOTICED. The same was corrected by changed the gear box with new one.

B)IN1/88.During the drive shaft bearing checking the south arm bearing housing bottom half found cracked. The hosing was changed with new one.

17)S4 TOWER:-A)IN 6/76.The 9.6:1Gear box in put shaft found bent by 1mm.Replaced with a new shaft.

B)IN 8/82.The 8/A.brake drum shaft north bearing was running noisy.Hence a new bearing fixed.

C)IN 4/87.The type"D"Body changed.

D)IN 6/87.The north arm 4"drive pipe:- The vertical rain cover slotted area which accommodating the drive pipe fell on the pipe and started cutting the pipe while the drive shaft in rotation on the north side at the platform.It made a deep cut on the shaft[2to3mm].The shaft was replaced with a new pipe in which type"D" Stub shaft and rigid flange stub shaft welded.

18)S5 TOWER:-IN 4/93.While taking radial gap measurements some sound noted in 36:1 gear box.The gear box was opened and found the input shaft bearing sound and the bearing was wornout.The bearing was replaced with a new bearing. For the safty of the Telescope in all the 23 frames the input shaft bearing changed with a new bearings.

19)S6 TOWER:-IN 2/87.The south rigid coupling was loose on the shaft.The same was corrected.

20)S7 TOWER:-NIL.

21)S8 TOWER:-A)The 10"Flexible coupling gap increased from 4mm to 13mm.The gap was corrected to 4mm. [5/76]

B)IN 10/87.The rigidflange was loose on the bearing shaft in south arm bracket.Metal was filled inside the flange bore and machined to size and fixed tightly

22)S9 TOWER:-A)The 10"Flexible coupling [south] gap increased from 4mm to 13mm.Corrected to 4mm.[3/80].

B)IN south arm rigid coupling sound. New key way and new key fixed.[12/80].

23)S10 TOWER:-A)IN 2/87.The type"D" changed.

B)IN 10/88.The south 10"flexible coupling gap was zero. The bolts of the rubber cone rings were started getting loose while running.The same was corrected by sliding the shaft to south and made a gap of 5mm.

C)IN 11/88.The type"D"Body changed.

D)IN 4/90.The 19mm.Sprocket was loose on the stub shaft. Metal filled over the shaft and fixed the sprocket tightly.

24)S11 TOWER:-NIL.[GENERAL MAINTENANCE CARRIED OUT]

25)S12 TOWER:-A)IN 4/77.The 36:1 Gear box sound.Bearing problem and corrected.[second stage bearing].

B)IN 12/85.In drive sector No:-2 the "Y" gap was -0. So the sector 2 was slotted and moved north by 4mm.

I /)THE PERFORMANCE OF THE IMPORTANT MECHANICAL PARTS IN THE O.R.T.  
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DRIVE SYSTEM:-  
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1.The Type"C"Universal Couplings  
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a)Type"c"body[5times new piece changed + 7times metal filled and fixed]

b)Sliding shaft[5times new piece changed + 4times metal filled and fixed]

c)1.75"sq.bush[2times new piece changed]

d)1"Dia.Pin[5times new piece changed]

{Eventhough the Type"C"coupling worked the wear and tear and the noice is too much.Also as maintenance point of view it is very tiresome to carry out the correction works. So recently with the consultation of M/S.T.C.E. a NEW GEAR COUPLING was installed

between S2-S3. Center column in 9/95. which is a maintenance free system. Sofar the performance of coupling is satisfactory. Decided to fix in all the other center columns.}

## 2. THE 4" DRIVE SHAFT TWO ROW BALL BEARINGS [changed with NEW ONES]

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- a) IN DRIVE PLATFORMS :- 11 places.
- b) IN NORTH ARM [Na] :- 8 places.
- c) IN SOUTH ARM [Sa] :- 12 places.
- d) IN CENTER COLUMN [Cc] :- 16 places.

{In 1972 during Re-modification of the O.R.T. Drive System the Bogos Bearings [Original Erection time Bearings] 29 Nos. were changed to S.K.F. BEARINGS. }

## 3) 10" FLEXIBLE COUPLINGS [Corrections carried out]

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- a) NEW COUPLINGS CHANGED :- 3 Nos.
  - b) RUBBER CONE RINGS CHANGED :- 38 times. [34 full sets + 4 Partly]
  - 4) RIGID COUPLINGS [Corrections carried out]
- 

- a) NORTH ARM BRACKET :- 1 New fixed + 2 Metal filled and fixed.
  - b) SOUTH ARM BRACKET :- 2 Key correctons + 8 Metal filled and fixed.
  - 5) ANTENNA POSITION INDICATOR.
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This system was designed by Shri. S.S. BHAVE and fabricated at T.I.F.R. Work Shop. This Indicator was working trouble free for the last 26 Years and recently we have made a new Gear Boxes.

## D. PREVENTIVE MEASURES (Structural/Mechanical)

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### 1. MONTHLY.

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- a) "Q" Heights Measurements.
- b) Angular Deveation Measurements. To check the Torsion in the drive-shaft in each platform. [The angular index is fixed on south of 4dia. Drive shaft.]

2. BYMONTHLY.

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a) O.R.T. STRUCTURAL INSPECTION.

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All the critical welding NODE POINTS checkup. Also any deviation in the structural parts to be checked.

b) O.R.T. MECHANICAL DRIVE SYSTEM INSPECTION.

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All the MECHANICAL DRIVE SYSTEM PARTS to be checked.

3. YEARLY.

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a) Radial Gap Measurements

b) 4dia. Drive Shaft Bearing Re-Greasing. [This may be carried out once in 2 years.] For any sound it should be inspected immediately.

c) Pivot Shaft Bearing Re-Greasing. [This may be carried out once in 2 years.] For any sound it should be inspected immediately.

4. ONCE IN 4 YEARS.

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a) The Re-Painting of the O.R.T. [330 TONNES OF STEEL STRUCTURE]

b) 19mm & 14mm STEEL GUY ROPES Greasing [SURROT-30]

5. ONCE IN 2 YEARS.

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a) The Painting touch up where-ever necessary.

CONCLUSION:-

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THIS REPORT IS PREPARED BASED ON THE PROPER RECORDS AVAILABLE WITH ME. I JOINED IN RADIO ASTRONOMY GROUP IN AUG. 96. SO I PREPARED THIS REPORT FROM 1996 ONWARDS. ANY SUGGESTIONS MAY BE WELCOMED FROM THE SCIENTISTS AND ENGINEERS FOR THE BETTERMENT OF THE OOTY TELESCOPE.



S.M. LOUIS.

ENGINEER "SD"

OOTY

Dt. 07-02-1997.



## MIN./MAX. RADIAL GAP MEASUREMENTS [1996 TO 1994]

TOWERS	MIN. (mm)	MAX. (mm)	MIN. (mm)	MAX. (mm)	MIN. (mm)	MAX. (mm)
N12.	70/1.5	150/5	100/0.5	170/4	60/2.5	160/6
N11.	50/2	150/5	50/2	110/6	60/2.5	140/6
N10.	120/2	170/5	50/3	130/5	120/2	140/5
N9.	60/3	30/6	60/3	30/5	110/2.5	140/5
N8.	60/4	80/6	60/4	90/6	170/1.5	130/4.5
N7.	70/4.5	160/5	80/3	130/6	80/2.5	150/6
N6.	70/1.5	140/4	60/2	190/5	50/2	100/5
N5.	80/1.5	30/6	180/2	100/5	70/1	110/5
N4.	50/3	130/6	50/3	190/5	70/4	130/6
N3.	180/2.5	130/5	130/4.5	60/5	160/2	90/6
N2.	160/0	60/4	160/1.5	40/4	70/3	130/5
N1.	80/4	30/5	90/0	30/5	90/2	180/4.5
S1.	30/4	170/6	40/1	180/5	40/2	140/6
S2.	60/3	140/5	60/1	180/3	30/2	160/4.5
S3.	80/2	40/5.5	140/3	30/4.5	90/2	30/6
S4.	170/4	30/5.5	50/3	90/5	160/1.5	90/4
S5.	30/3.5	80/6	90/2.5	70/6	100/2.5	130/5
S6.	100/3	190/5	100/4	40/5	90/3	150/5
S7.	190/3.5	60/6	160/3.5	40/5.5	170/2	70/5
S8.	130/4	180/6	120/3.5	40/6	40/3	170/4
S9.	60/3	130/4	160/2.5	100/5.5	60/3	120/5
S10.	160/3.5	100/5	110/3	60/5.5	160/2.5	50/7.5
S11.	80/2	180/6	60/1.5	180/6	60/2.5	170/5
S12.	30/4	170/6	30/3	150/5.5	30/4	170/5

DETAILS:-S12. 30/4=[30=Drive sector pin number+4=Radial gap]

In general all O.Kay.

## O.R.T. STRUCTURAL

-----  
MAJOR MODIFICATIONS & REPAIRS:-  
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1) Since the unbalance load on each parabola was around 1,80,000 ft.lbs. it was decided to add additional counter weight to reduce the unbalance. Accordingly in 1975 a counter weight arm of 1 Tonne and a counter weight (concrete) of 2 Tonne was added to the long arm of parabola between node points 11 & 12. since N12 & S12 were end frames and only 500Kgs. of weight (concrete) was put (TCE-29-C/210 dated 4.5.1977).

After this during 1978 the N10. parabola front channel at node point No.9 connecting 11 & 12 to back got buckled and counter weight came to rest on the Drive Sector. This was repaired but another check for strength done, which necessiated in strengthening the front channel by welding angles to the sides between node points 8,9 & 10 as also fixing bigger channel pieces at node points 9 & 10. Further the cross bracings between node points 9 & 10 to 11 & 12 (north & south) at the counter weight arching were increased in thickness by welding 6mm. flats over the angles.

During 1983 a hairline crack was noticed at the joining gusset & angle at N1. Again this anchoring points were strengthened by welding extra angle piece in all Towers.

2) Regular welding check-up, painting etc. were done.

Re-Painting was carried out in the following years:- 1973,75,77,79,81,83, 87,91&95. [From 1973 to 1983 once in 2 years painting was done and after 1983 onwards painting was carried out once in 4 years]

3) During 1975 after fixing counter weight " Q " HEIGHTS were readjusted. At that time it was found that a small hairline crack was noted at the top guy rod turnbuckles at S5.frame. This was tested at P.S.G. College of Techonology for ultimate breakage strength. On testing it was found that

the hairline crack was not weakening the strength as required for this turnbuckles. For safety sake the following turnbuckles were changed at S5, N5, N2&S4-12.

4) The drive platform channels under 9.6:1 gear box and slew motor was vibrating. Hence strengthening plates were welded in 1978.

5) All pinsectors were refixed and properly bolted in 1974/75. to get the pinion wheel runs freely without touching the sides of the Drivesector as also the Radial gaps are between 1mm. (minimum) to 6mm. (maximum) in all the Frames. Also the N8, N3, N2&S12 Sectors shifted to get proper side gaps (x & y) so that pinion never overrides the pinsector. (1985)

5) Generally there was not much problems in bent supports, feed towers, feed frames & drive sectors during these periods.

6) During 1984. about 200. S.S. Wires of parabolic reflector were put as NEW.

[THIS REPORT WAS PREPARED BY Mr. M. K. BHASKHARAN/S. M. LOUIS]

Ref: RAC/ 184 /

December 20,1973

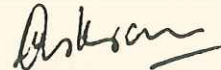
Prof. G. Swarup  
Radio Astronomy Group  
Tata Institute of Fundamental Research  
Homi Bhabha Road  
Bombay - 5

Dear Prof.Swarup,

With reference to your letter dated 12th December 1973, regarding Type 'C' bodies I am herewith attaching Table 'A' (Showing the bodies in use and spares and also wanted), and Table 'B' (Showing frames, gaps, bodies in use and bodies desired for your information). From Table 'A' the bodies required may be made in TIFR Workshop. I have already sent to Shri J.D.Isloor, the drawings. Please ask him to write to me if he has any doubts.

Thanking you,

Yours sincerely,



M.K. Bhaskaran  
Maintenance Engineer

MKB/mm

TABLE 'A'

<u>Length of Body</u>	<u>No. in use</u>	<u>No. Spares</u>	<u>Nos. wanted</u>
6"	6	17	N11
6½"	-	-	5
7"	9	3	-
7½"	-	-	5
8"	9	-	-*
8½"	-	1	3
9"	-	2	-

\* No spares wanted as two will be spares when we change the 8" bodies with 8½" N11 - N12 and S11 - S12.

MKB/mm:201273

TABLE 'B'

<u>Frame</u>	<u>Gaps</u>	<u>Body size in use</u>	<u>Desired Body Size</u>
N12-N11(North)	30mm	8"	8½"
" (South)	30mm	6"	6½"
N11-N10	28mm	6"	6½"
N10-N9	16mm	8"	OK
N9-N8	13mm	7"	OK
N8-N7	23mm	7"	OK
N7-N6	20mm	6"	OK
N6-N5	7 mm	7"	6½"
N5-N4	30mm	8"	8½"
N4-N3	22mm	6"	OK
N3-N2	14mm	6"	OK
N2-N1	12mm	7"	OK
S1-S2	28mm	7"	7½"
S2-S3	9mm	8"	7½"
S3-S4	15mm	8"	OK
S4-S5	15mm	8"	OK
S5-S6	28mm	7"	7½"
S6-S7	18mm	7"	OK
S7-S8	28mm	7"	7½"
S8-S9	11mm	7"	OK
S9-S10	12mm	8"	OK
S10-S11	14mm	8"	OK
S11-S12(N)	29mm	6"	6½"
S11-S12(S)	29mm	8"	8½"

MKB/mm:201273

PROGRESS OF WORK FOR THE FORTNIGHT  
ENDING WITH 30.11.1973

Submitted to Dr.G.Swarup

ORT - MECHANICAL

- 1) All the 24 Nos. new magneto electric. ls Brakes fixed. I request you to confirm removing the 8' brakes on slew motors and fixing flexible couplings as we are starting this job.
- ii) N2 - N3 and S2 - S3 centre columns sliding shafts sound stopped by giving shims between sliding shaft and bush as instructed by you. The gap was 10 thousandths of an inch (wear on flat side).
- iii) Drilling of holes in the drive shaft near Type 'C' for 18 frames completed.
- iv) Greasing pin sector in progress. The trays for lubrication are being repaired.
- v) The three remaining bogus bearings at N10, S10, S10-S11 have been changed to SKF. Present conditions of bearings in system:
 

(i) Old USSR erection time bearings	: 79
(ii) Mahajan's time bearings	: 18
(iii) SKF bearings	: 30 Nos.
- vi) As you are in Bombay, I request you to contact Meccano Mechanics to send urgently the sprockets. Their address is Meccano Mechanics, Bombay - 34.
- vii) General maintenance and inspections done.

ORT - ELECTRICAL

- 1) All new brakes connection given, tested and working.
- ii) Overspeed tacho boxes brought to Electronics Lab and tested with Mr. N.V.Nagarathinam and Mr. N.V.G. Sarma. New boxes are being installed.
- iii) Dials are being fixed for monitoring differential synchro error voltage.
- iv) Stepping motor circuit has been tested (Basic Logic) and interlock circuits are being designed.
- v) New M.S. Toggle joint fixed for Tacho at servo which was loose. No false annunciators now.

ORT - Phase Shifter

- i) All scales have been fixed and pulley red marks made.
- ii) S11 - South module new shaft fixed as designed by you. Working satisfactorily.
- iii) Routine checking of scales have been done.
- iv) As 2 dials at control room were off all modules realigned to mean position and dials corrected.
- v) Measurements for Drive shafts as per your instructions for 22 modules being done.

INTERFEROMETER AND 15-ft. DISH

- i) RAC site tower fabrication done and erected in position.
- ii) 15-ft. dish checked and the components of Dipole are getting ready for alignment.
- iii) The pivot arrangement for vertical and horizontal movement of the dish getting ready.
- iv) Foundation for 15-ft. dish at North site being taken up.
- v) The trees in the view line has been cut off.
- vi) Control circuits of I.F. dishes are being planned.
- vii) Site clearing for 15-ft. dish in progress.

OTHERS

- i) A.C. room foundation has been laid. Construction will be started.
- ii) Roads are being cleared from grass and drain is being made on the sides.
- iii) Painting of interior western walls of RAC buildings in progress.

MKB/mm:051273



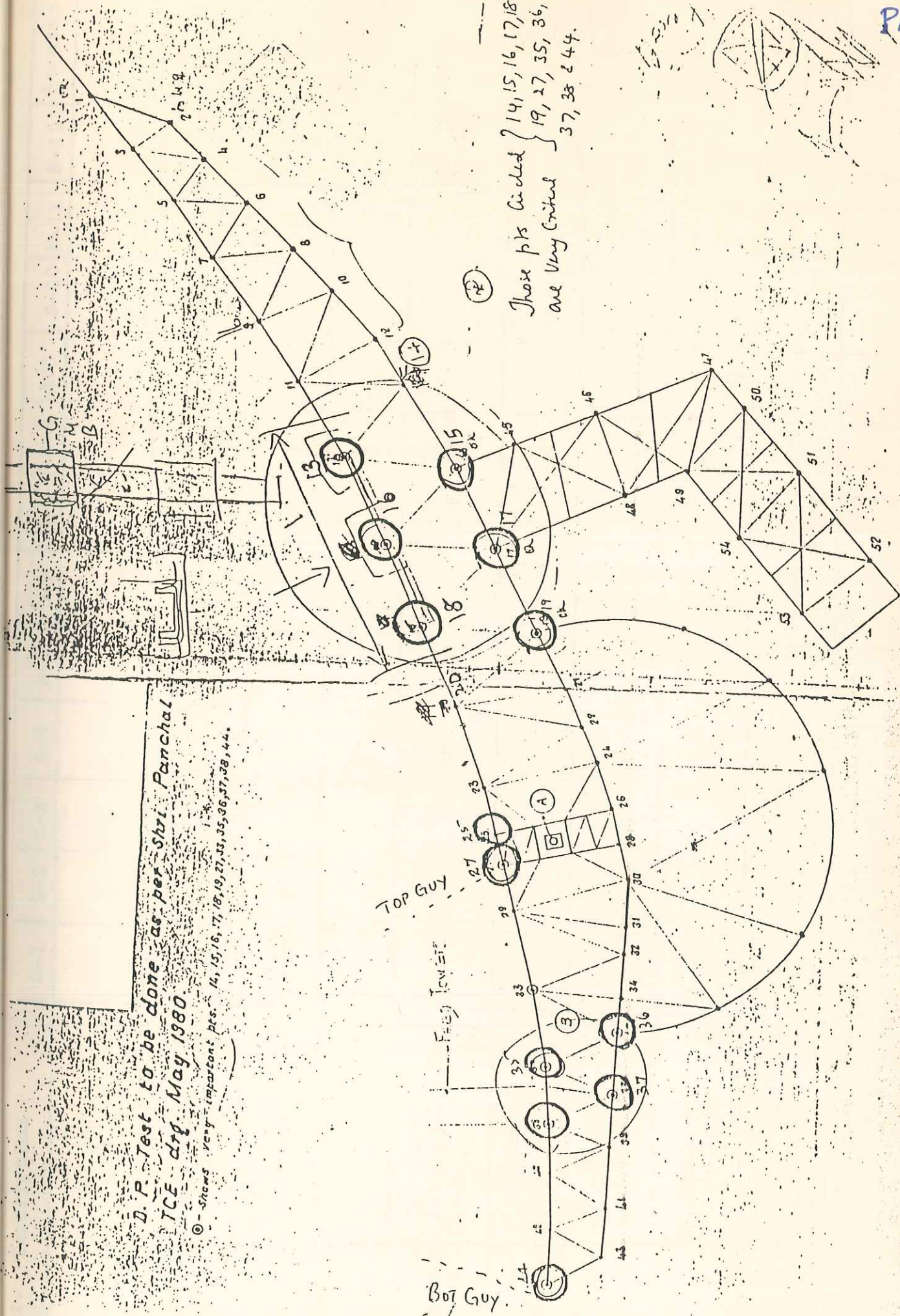
Sr. NO.	Description	N-12	N-11	N-10	N-9	N-8	N-7	N-6	N-5	N-4	N-3	N-2	N-1	Remark
1.	Parabola critical node points 13,14,15,16,17,18,19,25,27,25,36,37,38 and 44 (14 points)													
2.	2 Ton counter weight (visual view of 24Nos in line)													
3.	Feed Tower (visual view of 24 nos.in line)													
4.	Feed Truss (visual view of 23 nos.in line)													
5.	Bend support (Overall checking of any angle buckling+visual view)													
6.	Center column frame+ base bolts.													
7.	Top gayrod mounting bracket welding check-up + overall view from N-12 to S-12.													
8.	Bottom gay rod (overall view from N-12 to S-12)													
9.	14mm + 19mm gay ropes + turn buckles (any uneven looseness)													
10.	All the foundation Bolts +nuts (looseness+ rust)													
11.	Rmarks													

Sl. NO.	Description	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10	S-11	S-12	Remark
1.	Parabola critical node points 13, 14, 15, 16, 17, 18, 19, 25, 27, 35, 36, 37, 38 and 44 (14 points)													
2.	2 Ton counter weight (visual view of 24Nos in line)													
3.	Feed Tower (visual view of 24 nos.in line)													
4.	Feed Truss (visual view of 23 nos.in line)													
5.	Bend support (Overall checking of any angle buckling+visual view)													
6.	Center column frame+ base bolts.													
7.	Top gayrod mounting bracket welding check-up + overall view from N-12 to S-12.													
8.	Bottom gay rod (overall view from N-12 to S-12)													
9.	14mm + 19mm gay ropes + turn buckles (any uneven looseness)													
10.	All the foundation Bolts +nuts (looseness+ rust)													
11.	Rmarks													

Checked by:

MECHANICAL ENGINEER

sp/23.2.95



D.P. Test to be done as per Shri. Panchal  
 TCE dtg. May 1980.  
 Shows very important pts. 14, 15, 16, 17, 18, 19, 27, 33, 35, 36, 37, 38, 44.

Those pts circled  
 are Very Critical  
 14, 15, 16, 17, 18,  
 19, 27, 35, 36,  
 37, 38 & 44.

TOP GUY

FEED TOWER

BOT GUY

Sr. No.	Description	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10	S-11	S-12	Remarks
1.	36:1 gear box (any sound)													
2.	19T 57T D.sprocket + duplex chain + Idler + lubrication													
3.	9.6:1 gear box + base bolt alignment													
4.	23T/46T sprocket + chain													
5.	12.5 HP Motor + Base bolt + C3 couplings													
6.	10" flexible couplings 2 Nos.													
7.	Rigid couplings 2 Nos.													
8.	10" DC Brake + Air gap (4.5mm)													
9.	Drive shaft bearings 6 nos. (bracket to Bracket)													
10.	Pin sector + pinion + lock + lubrication													

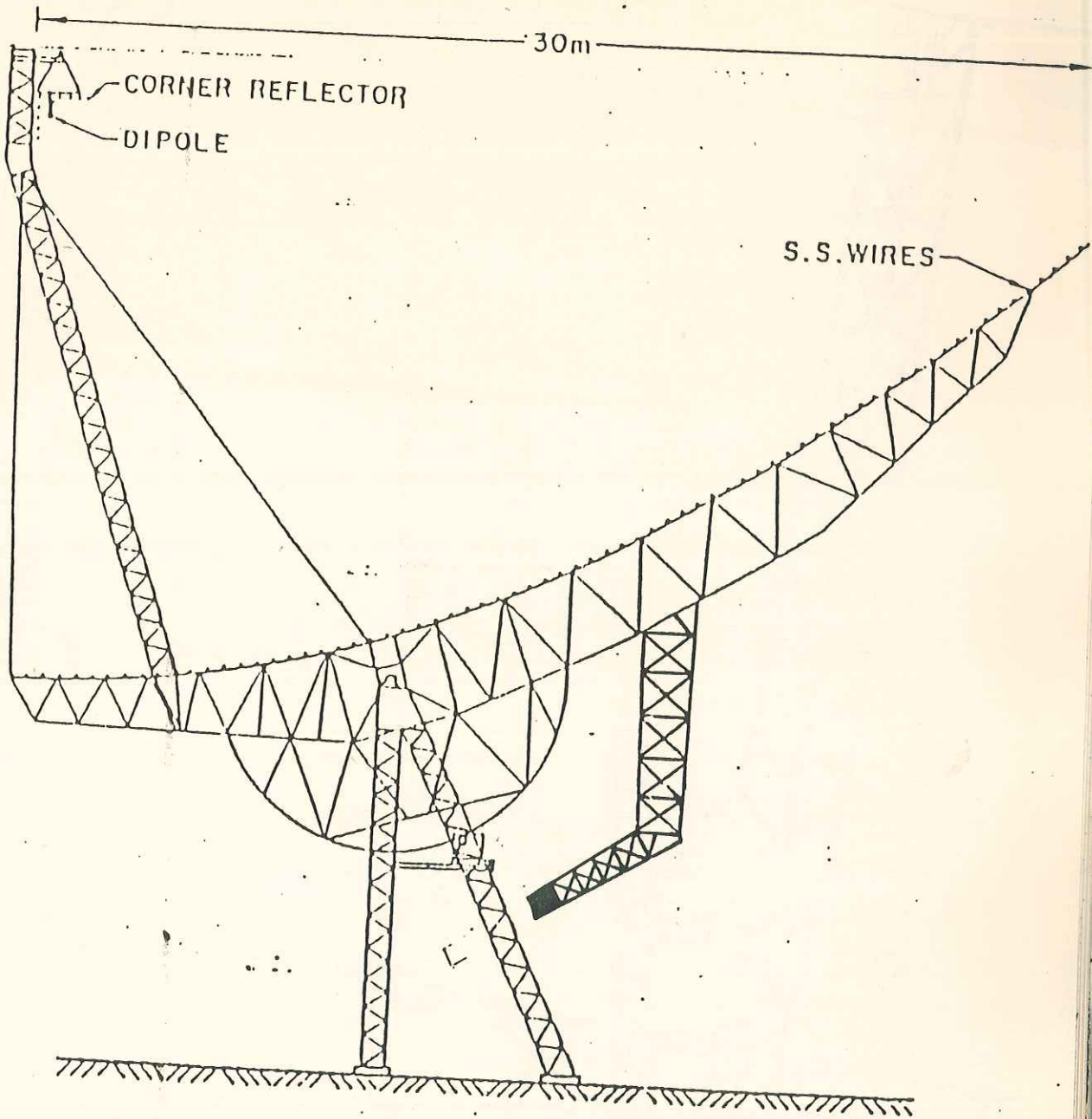
Date,

Sl. No.	Description	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10	S-11	S-12	Remarks
11.	Plyvt shaft bearing.													
12.	S.S. wire													
13.	End connection													
14.	Type 'C' + bearing + C.C.support + base bolt													
15.	250:1 gear box C1 coupling (any sound)													
16.	Common clutch (24 Thou)													
17.	Duplex sprocket + chain+lubrication													
18.	10" flexible couplings. 2 Nos.													
19.	Overall Lubrication													
20.	Remarks													

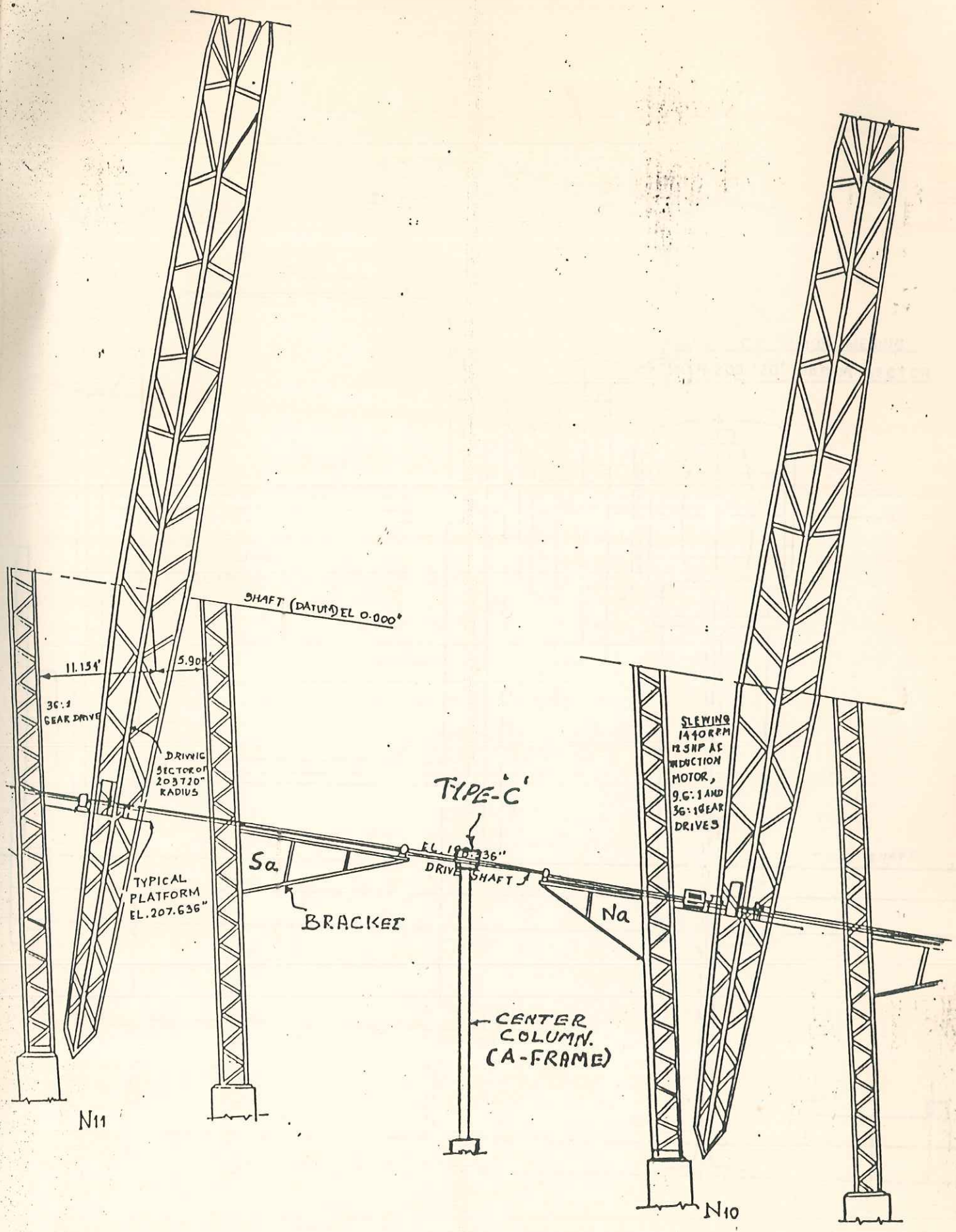
vsp/23.2.95

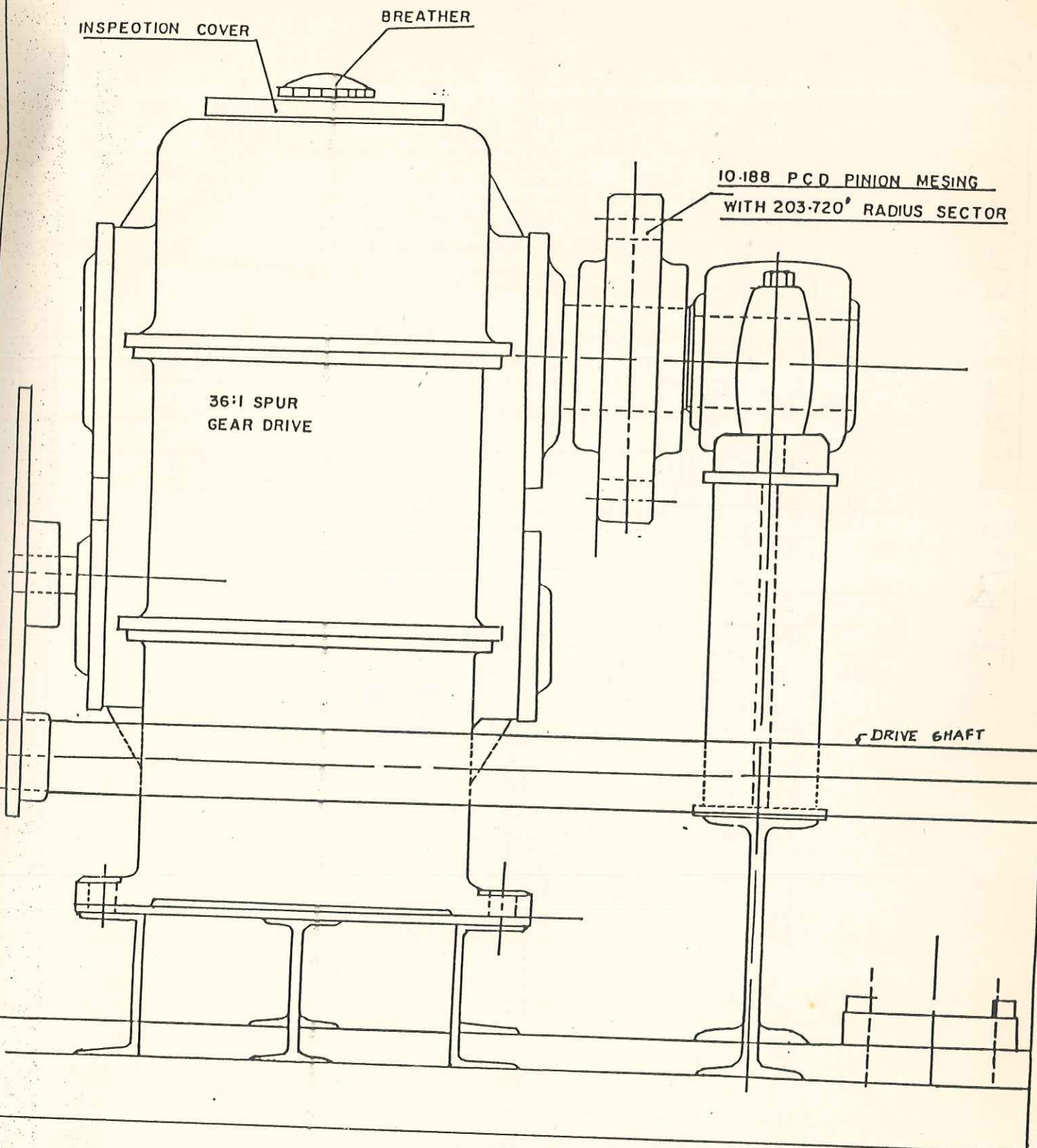
Checked by:

MECHANICAL ENGINEER



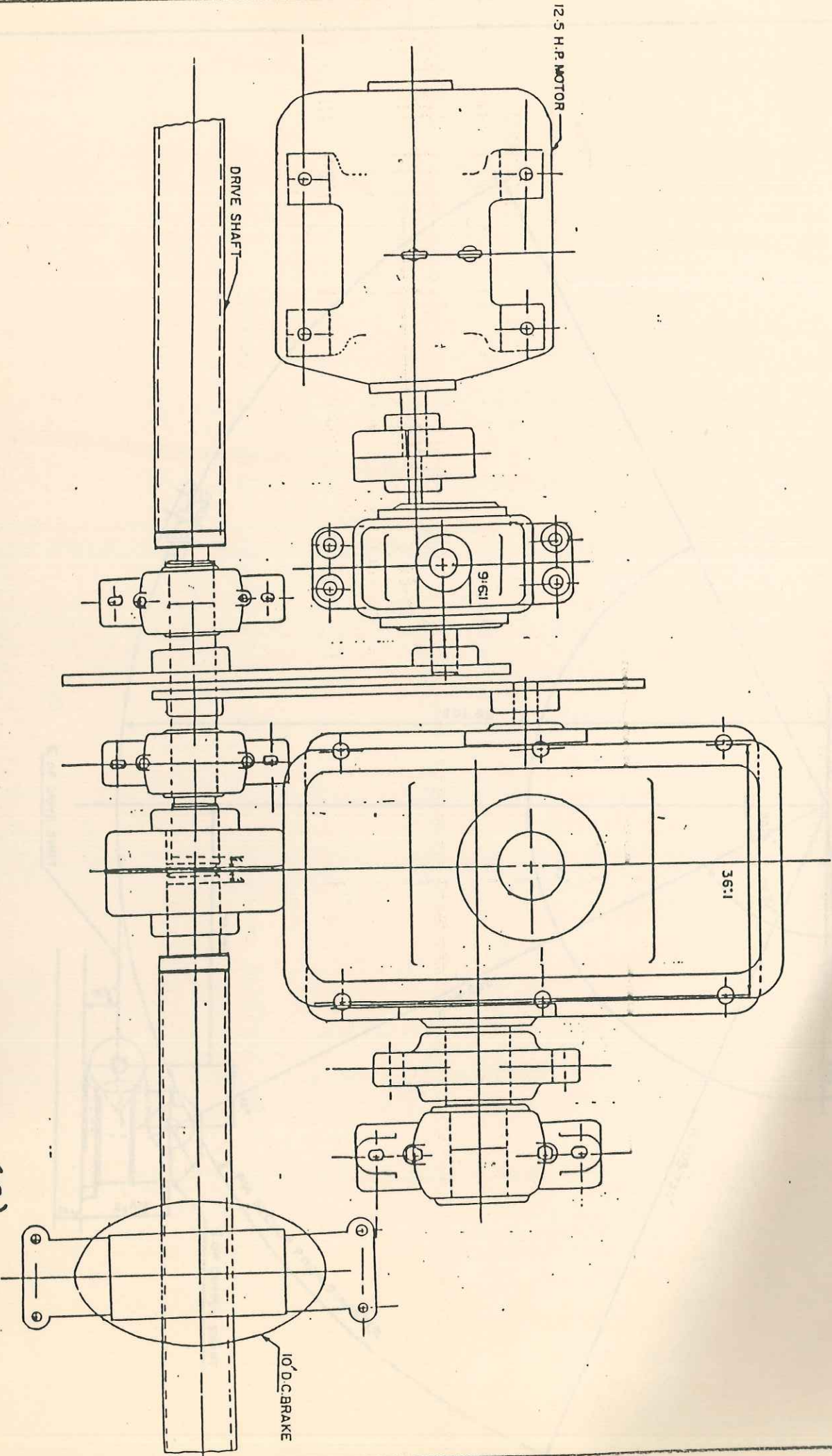
A sketch showing the details of one of the 24 parabolic frames of the Ooty radio telescope.





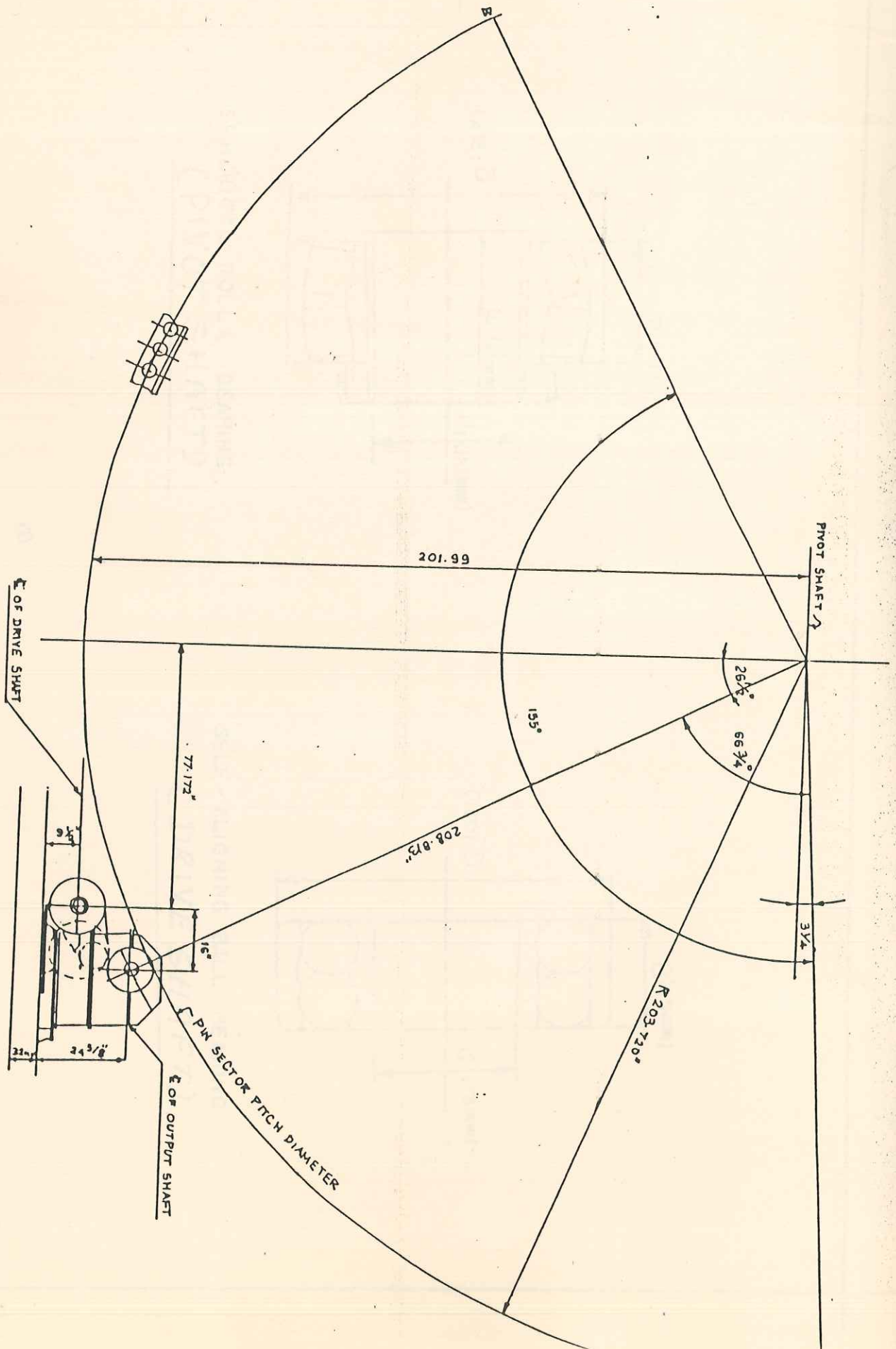
MAIN GEAR BOX.

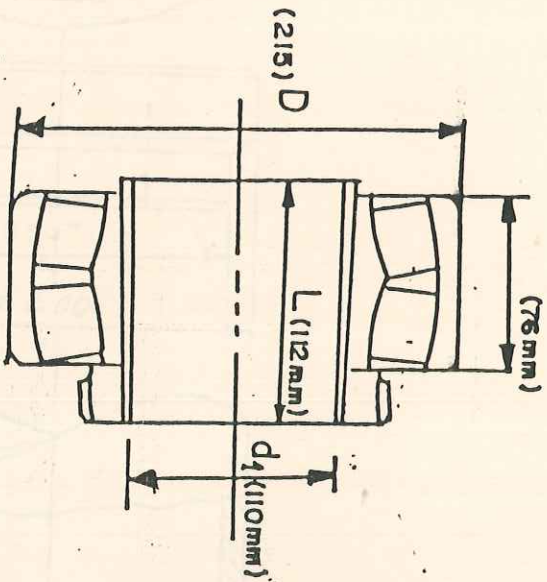




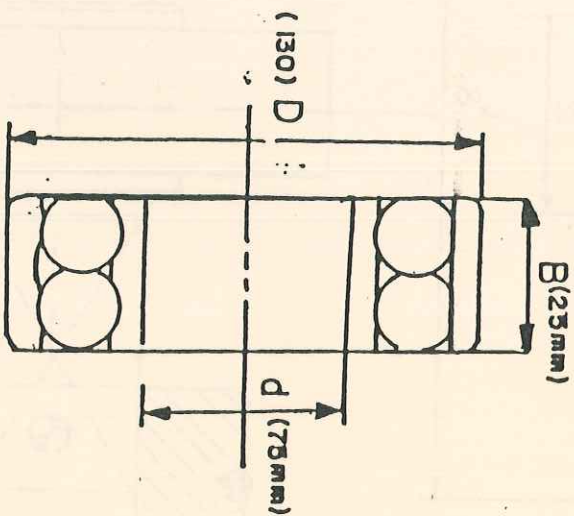
DRIVE PLATFORM (OLD-69)

# ORIENTATION OF THE DRIVE





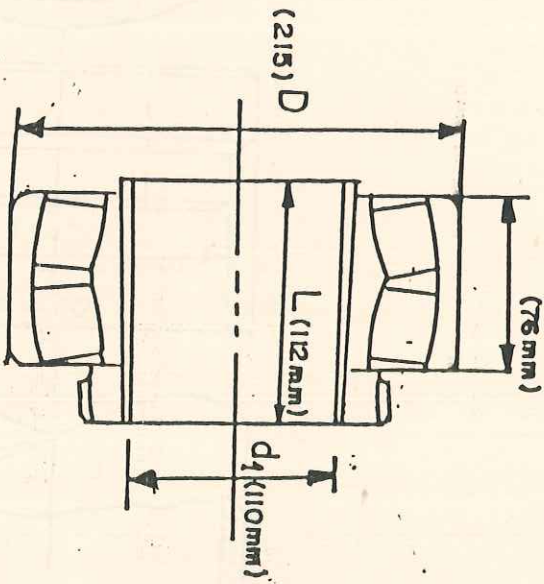
SPHERICAL ROLLER BEARING  
(PIVOT SHAFT)



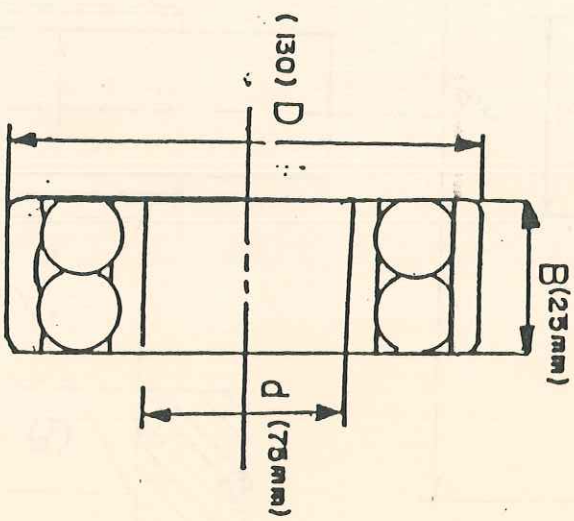
SELF - ALIGNING BALL BEARING  
(DRIVE SHAFT)

00

R



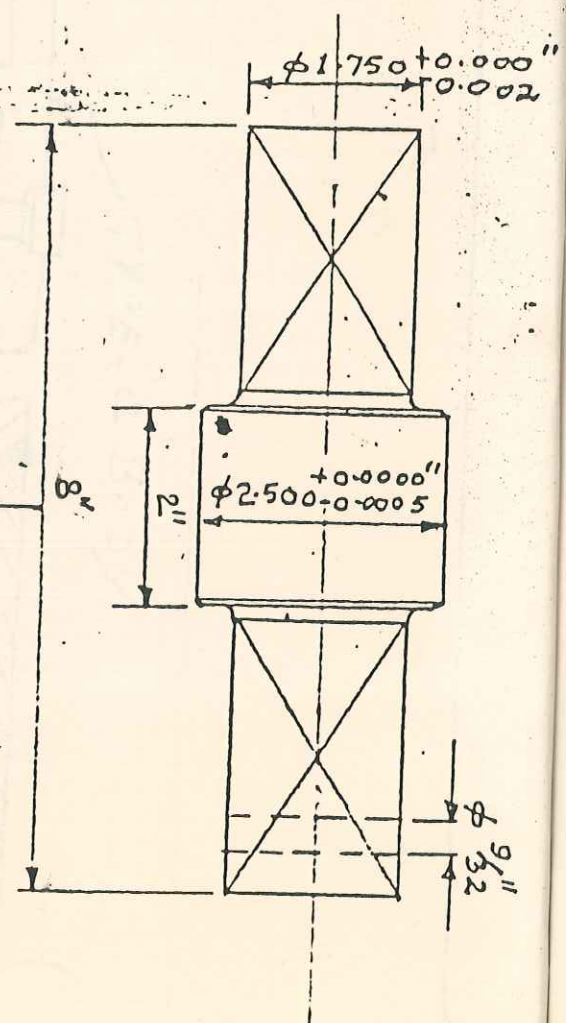
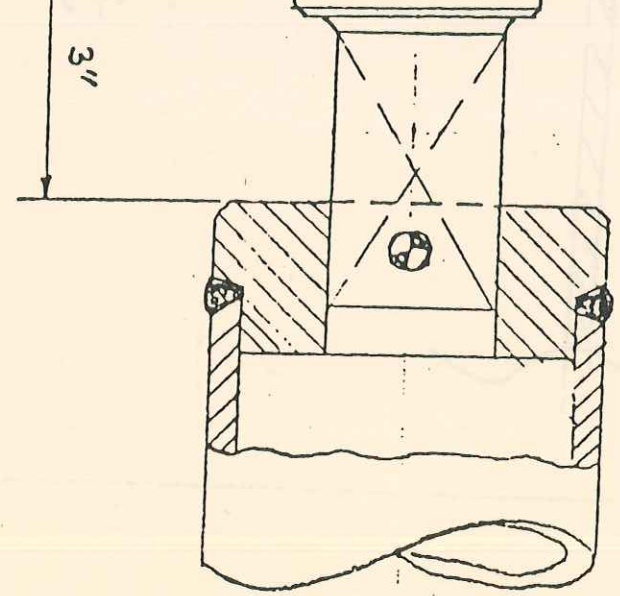
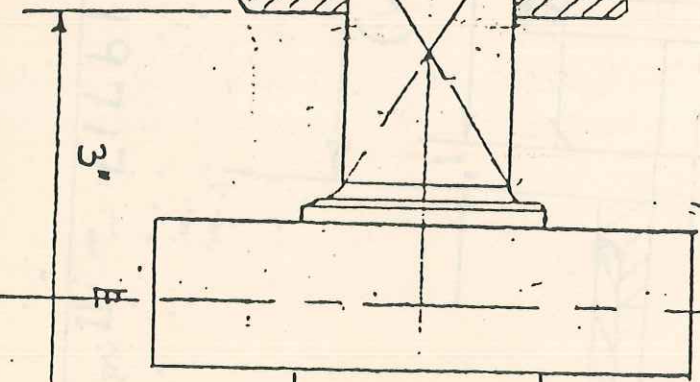
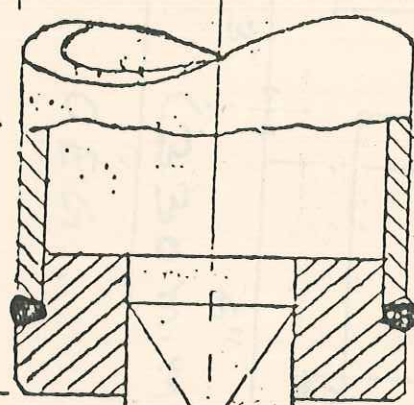
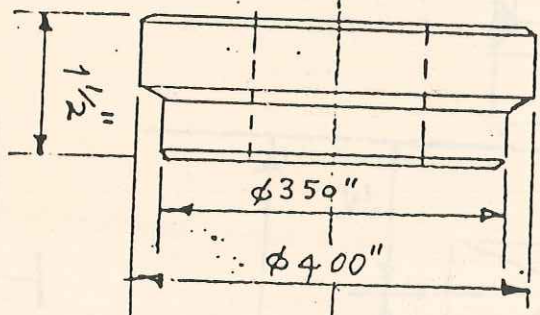
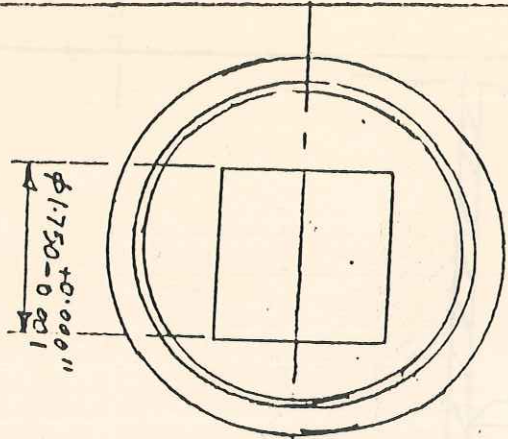
SPHERICAL ROLLER BEARING  
(PIVOT SHAFT)



SELF-ALIGNING BALL BEARING  
(DRIVE SHAFT)

R

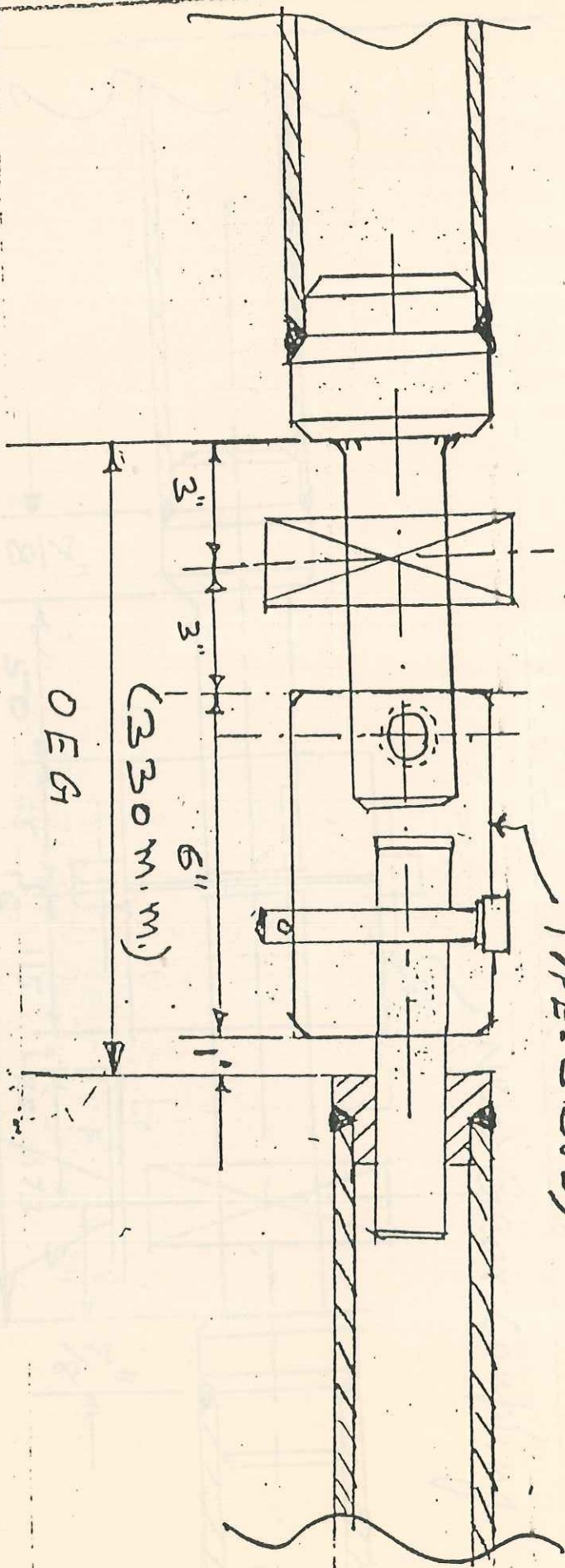
D



SQUARE BUSH.

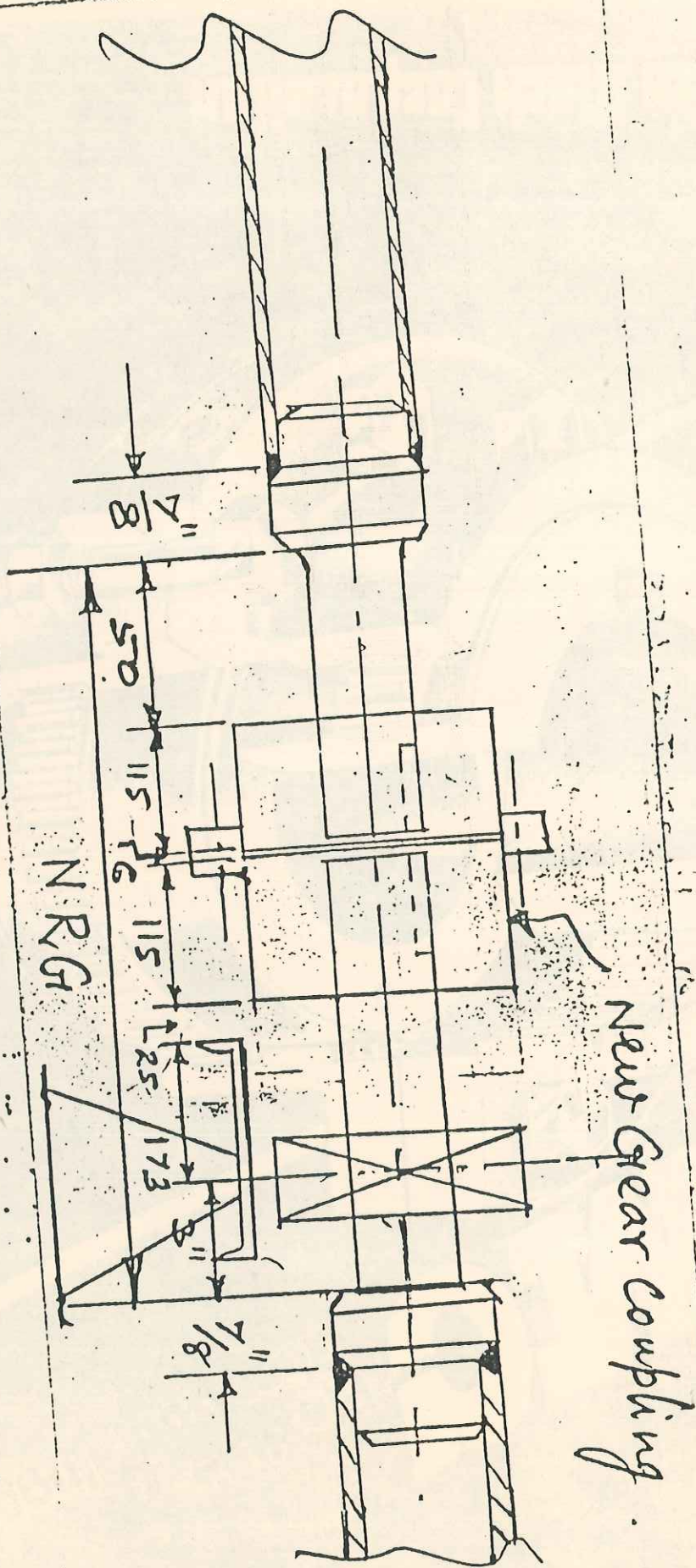
SYSTEM OF CENTER COLUMN-1969

FLEXIBLE INTERCONNECTION. (TYPE 'C') - I<sup>ST</sup>.



TYPE 'C' - [ 19717 ] - II<sup>nd</sup>

NEW TYPE : [ 1957 ] - III<sup>rd</sup>



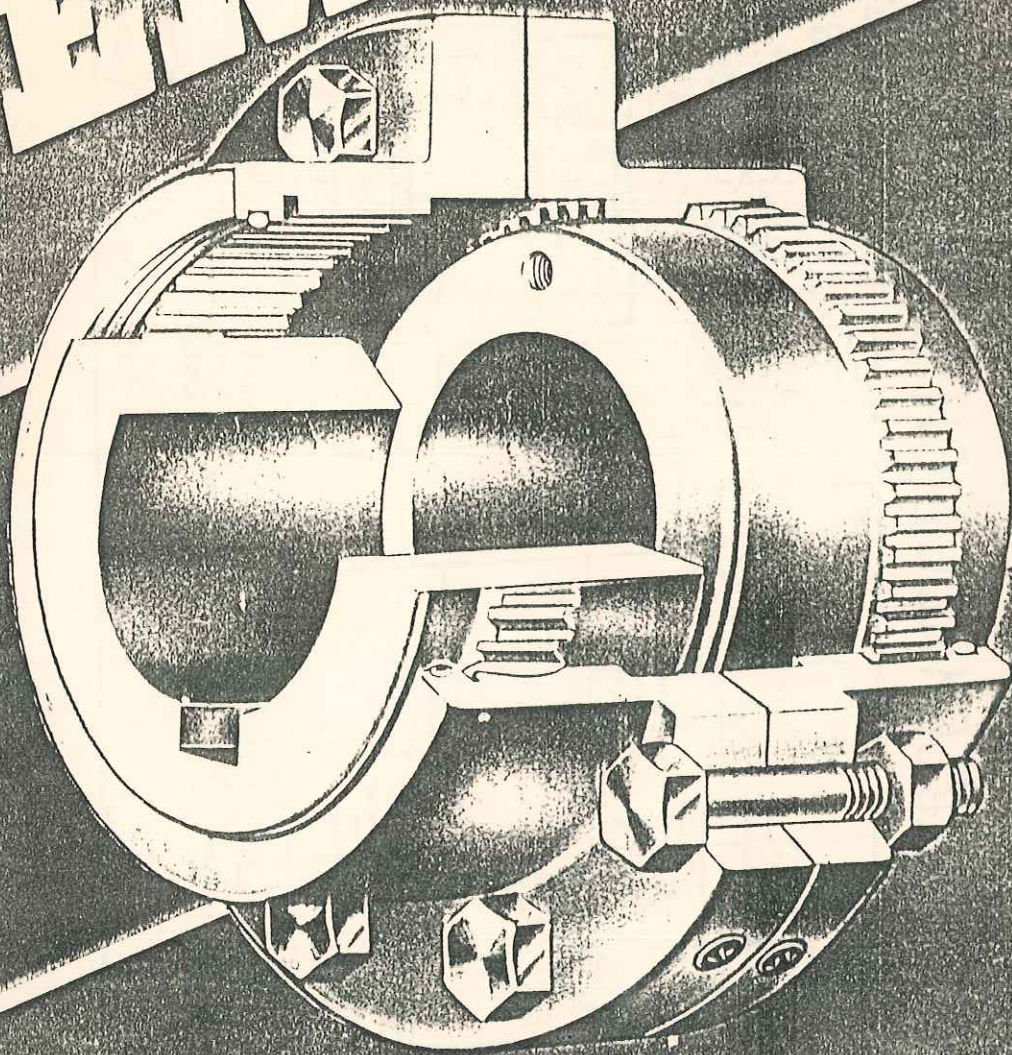
NEW TYPE C-F 19951-III<sup>rd</sup>.

New Gear coupling

CAPACITY AND RUGGEDNESS ARE BUILT IN QUALITY OF

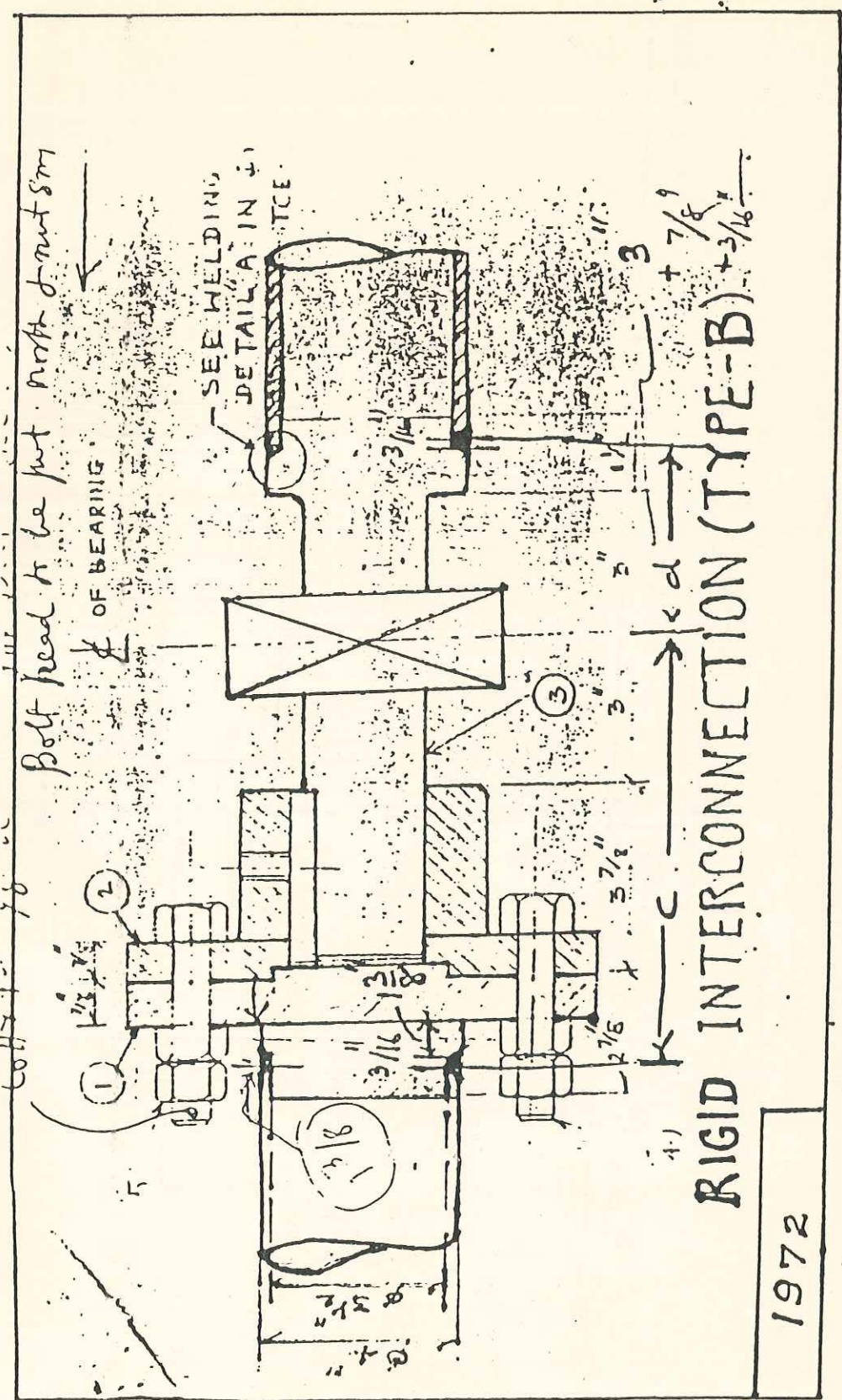
# EMC

Flexible  
Gear Couplings



Electro Mach Corporation





Bolt head to be put north of nut on

OF BEARING

SEE WELDING DETAIL IN FIGURE

RIGID INTERCONNECTION (TYPE-B)

1972

S3

SA (Existing Gaps)

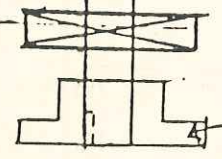
5970

375

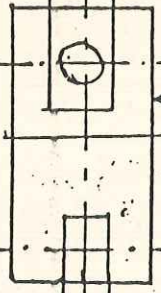
5510

NCC

(SA)



Rigid Flange



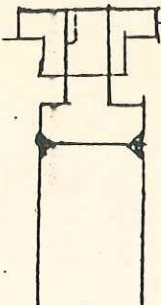
SPEC



Bearing

SCC

(NA)



Rigid Flange

5786

184

375

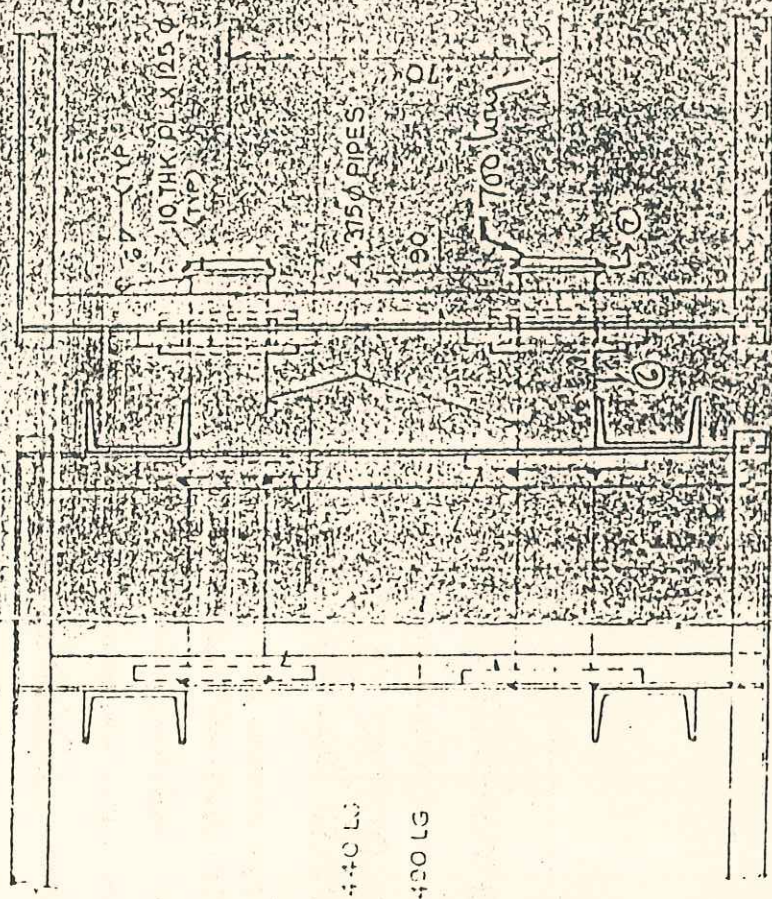
5510

DETAILS OF DRIVE SYSTEM Betw. TOWERS

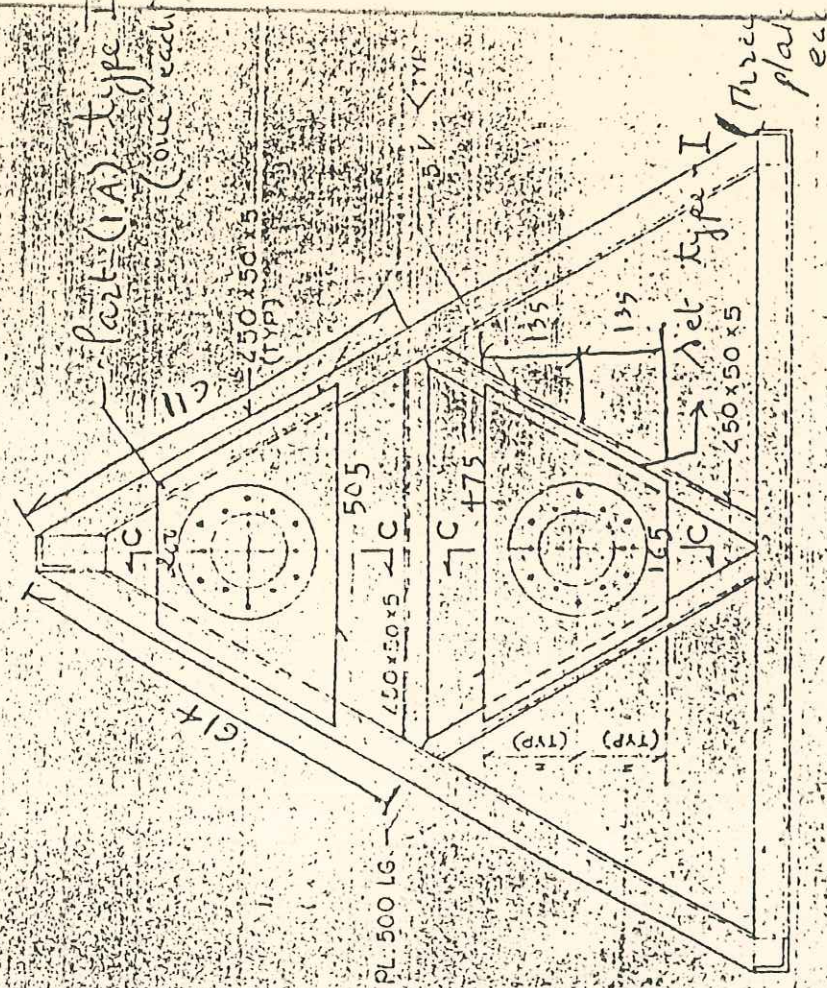
1972

± FEED TOWER  
A ← B

175 175 200



2 THK PL 440 LG  
2 THK PL 490 LG



270 x 10 THK PL 500 LG

VIEW B-B

DETAILS OF END CONNECTION. [FEED-TRUSS]

1971

NOTES