

H. Yamaoka

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送信日時: 1999年10月18日 11:09  
件名: 第8回JLC構造体ミーティングの案内

皆様

第8回JLC構造体ミーティングを明日火曜日(10月19日)に行います。

日時: 10月19日、午後1時30分～午後3時

場所: 3号館4階423号室。

予定議題: (1) support tube両端の振動を逆位相にしたときの計算

(2) 4つの離散的な入力振動ではなくて、support tubeの固有振動数も含む連

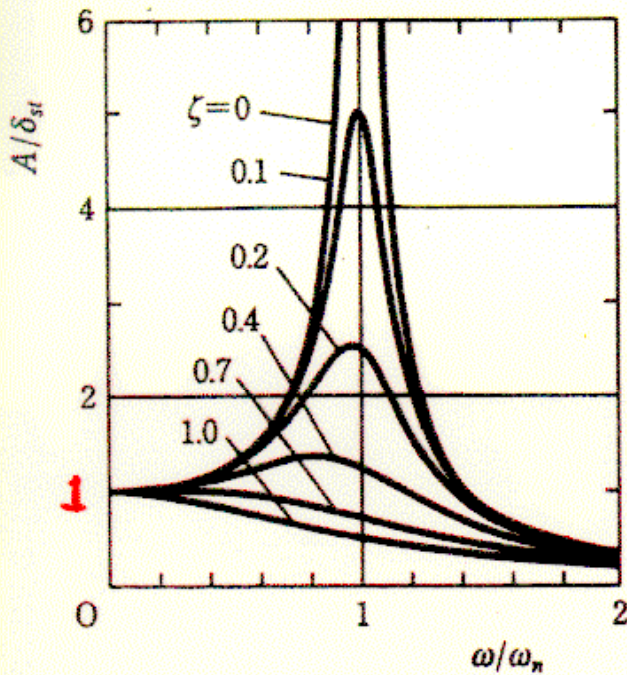
続的な振動spectrumを用いた計算、

場所に注意: いつもの場所の隣です。

よろしく御参集ください。

田内。

# Assumption



A: Amplitude

$\delta_{st}$ : Static Deformation

$\zeta$ : Damping ratio

$$A = \frac{\delta_{st}}{\sqrt{\left\{1 - \left(\frac{\omega}{\omega_n}\right)^2\right\}^2 + \left(2\zeta\frac{\omega}{\omega_n}\right)^2}}$$



表 3 - 4 設計用減衰定数の例

### 6.5.3 設計用減衰定数

「6.5.2 動的解析モデル」で述べた機器・配管系の動的地震応答解析には、次の値が用いられることが多い。

#### (1) S<sub>1</sub>地震応答用

設 備	減衰定数 (%)
鉄筋コンクリート構造物	5.0
建屋鉄骨構造物	2.0
溶接構造物	1.0
ボルト及びリベット構造物	2.0
配 管	0.5~2.5
空調用ダクト	2.5
ケーブルトレイ	5.0
ポンプ・ファン等の機械装置	1.0
電気盤	4.0
液体の揺動	0.5
燃料集合体 (BWR)	7.0
燃料集合体 (PWR)	10.0~15.0
制御棒駆動機構 (BWR)	3.5
制御棒駆動装置 (PWR)	5.0
1次冷却設備 (PWR)	3.0

#### (2) S<sub>2</sub>地震応答用

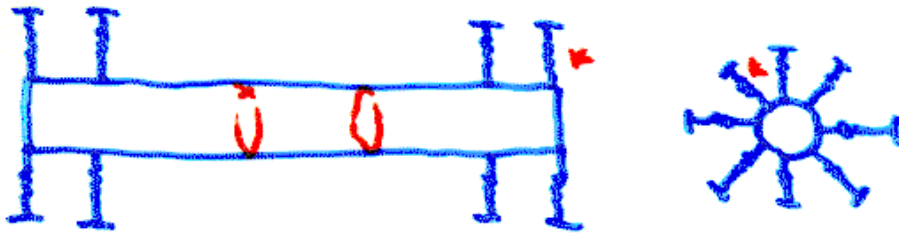
S<sub>2</sub>地震応答用として(1)で示した S<sub>1</sub>地震応答用の値が準用されている。

◦ Model

①



②



◦ Acc.

Freq.	x: Amplitude	a: Acc (gal)
3 mHz	3 μm	$1 \times 10^{-7}$
100 mHz	1 μm	$4 \times 10^{-5}$
1 Hz	10 nm	$4 \times 10^{-5}$
3 Hz	5 nm	$2 \times 10^{-4}$

$$a = \omega^2 \cdot x$$

$$= (2\pi f)^2 \cdot x$$

$$1 \text{ gal} = 1 \text{ cm/s}^2$$

$$1 \text{ G} = 980 \text{ gal}$$

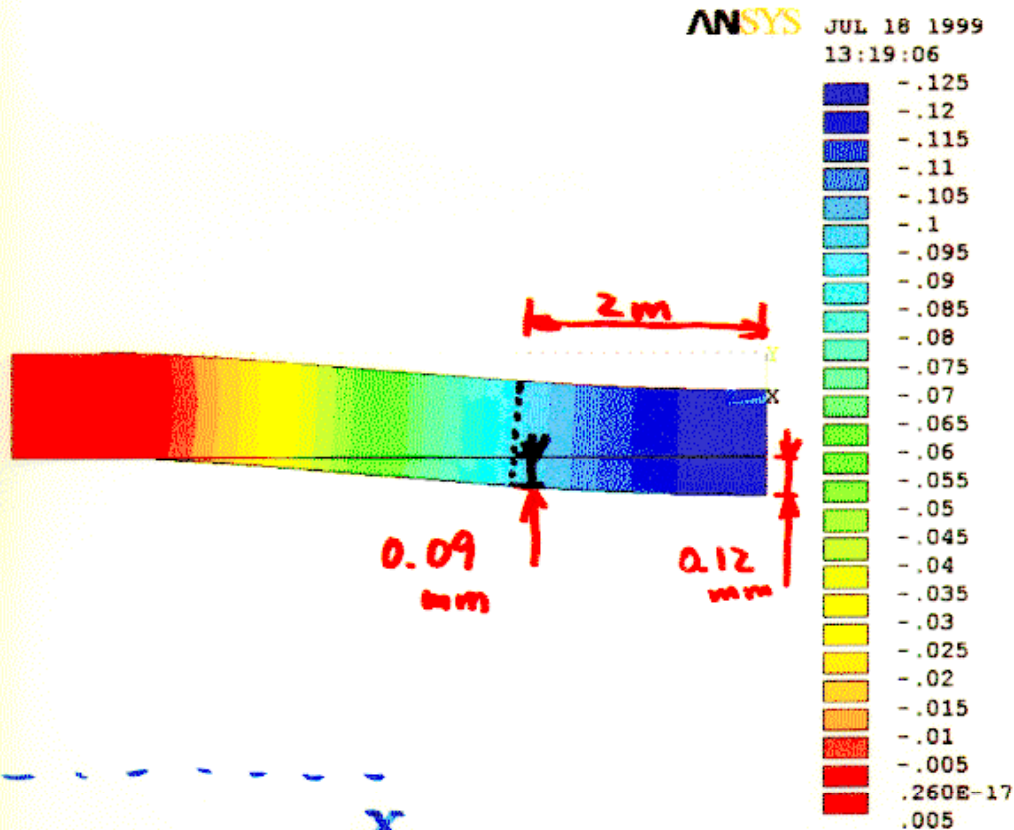
◦ Damping ratios

2%



# Static

## Deformation



3 Hz : 5 nm

$$a = (2\pi f)^2 \cdot X$$
$$= 2 \times 10^{-4} \text{ (gal)}$$

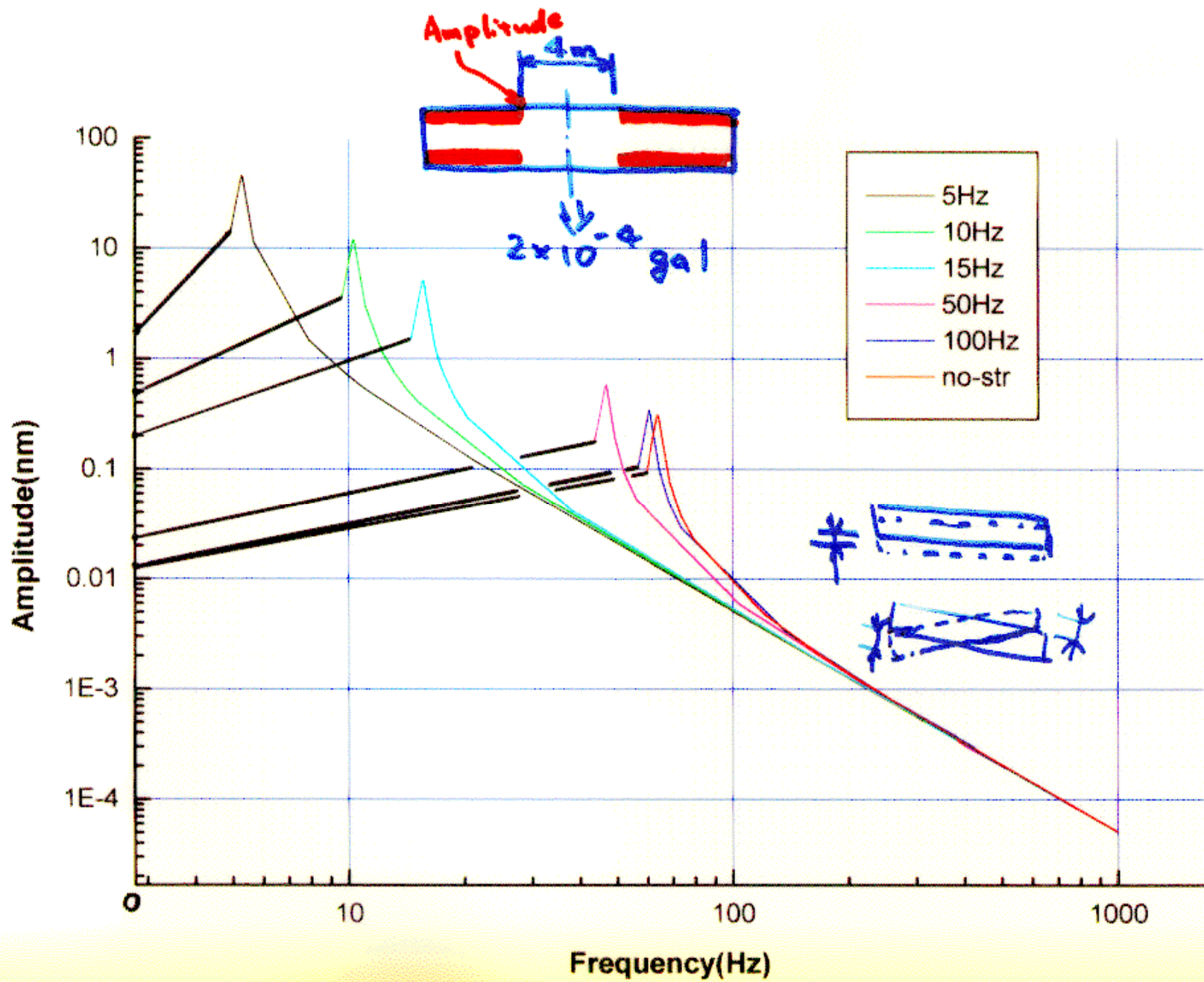
$$A = 0.09 \times \frac{2 \times 10^{-4}}{980}$$

$$= 1.8 \times 10^{-8} \text{ mm}$$

$$= \boxed{0.018 \text{ nm}}$$

$\beta = 0.02 \rightarrow$  20倍 (共振時)

$$\frac{\omega}{\omega_n} = 1 \Rightarrow 3.7 \times 10^{-7} \text{ mm} = \underline{\underline{0.37 \text{ nm}}}$$



Amplitude

4m

$2 \times 10^{-8}$  gal

Amplitude (nm)

Frequency (Hz)

- 5Hz
- 10Hz
- 15Hz
- 50Hz
- 100Hz
- no-str

100

10

1

0.1

0.01

1E-3

1E-4

0

10

100

1000

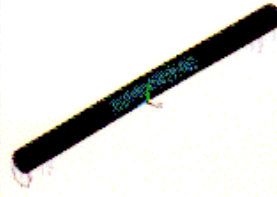
# 15Hz

1. 14.9 Hz



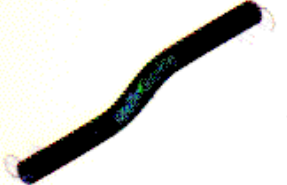
```
ANALYSIS  
UNIT = 1000  
DISPLACEMENT  
STEP 1  
MODE = 1  
FREQUENCY = 14.9  
DAMPING = 0.000000  
DYNAMIC ANALYSIS  
STEP 1  
MODE = 1  
FREQUENCY = 14.9  
DAMPING = 0.000000  
DYNAMIC ANALYSIS
```

2. 14.9



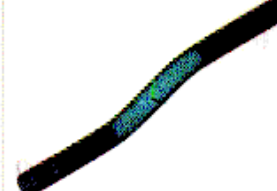
```
ANALYSIS  
UNIT = 1000  
DISPLACEMENT  
STEP 1  
MODE = 2  
FREQUENCY = 14.9  
DAMPING = 0.000000  
DYNAMIC ANALYSIS  
STEP 1  
MODE = 2  
FREQUENCY = 14.9  
DAMPING = 0.000000  
DYNAMIC ANALYSIS
```

3. 17.7



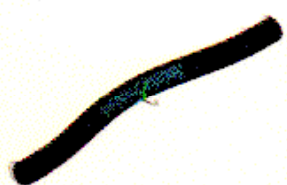
```
ANALYSIS  
UNIT = 1000  
DISPLACEMENT  
STEP 1  
MODE = 3  
FREQUENCY = 17.7  
DAMPING = 0.000000  
DYNAMIC ANALYSIS  
STEP 1  
MODE = 3  
FREQUENCY = 17.7  
DAMPING = 0.000000  
DYNAMIC ANALYSIS
```

4. 17.7



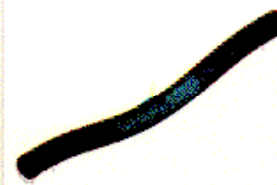
```
ANALYSIS  
UNIT = 1000  
DISPLACEMENT  
STEP 1  
MODE = 4  
FREQUENCY = 17.7  
DAMPING = 0.000000  
DYNAMIC ANALYSIS  
STEP 1  
MODE = 4  
FREQUENCY = 17.7  
DAMPING = 0.000000  
DYNAMIC ANALYSIS
```

5. 93.9



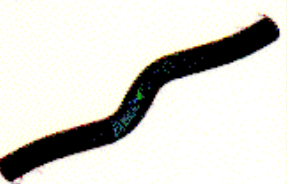
```
ANALYSIS  
UNIT = 1000  
DISPLACEMENT  
STEP 1  
MODE = 5  
FREQUENCY = 93.9  
DAMPING = 0.000000  
DYNAMIC ANALYSIS  
STEP 1  
MODE = 5  
FREQUENCY = 93.9  
DAMPING = 0.000000  
DYNAMIC ANALYSIS
```

6. 93.9



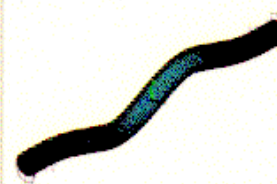
```
ANALYSIS  
UNIT = 1000  
DISPLACEMENT  
STEP 1  
MODE = 6  
FREQUENCY = 93.9  
DAMPING = 0.000000  
DYNAMIC ANALYSIS  
STEP 1  
MODE = 6  
FREQUENCY = 93.9  
DAMPING = 0.000000  
DYNAMIC ANALYSIS
```

7. 103



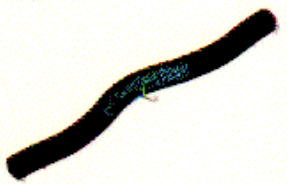
```
ANALYSIS  
UNIT = 1000  
DISPLACEMENT  
STEP 1  
MODE = 7  
FREQUENCY = 103  
DAMPING = 0.000000  
DYNAMIC ANALYSIS  
STEP 1  
MODE = 7  
FREQUENCY = 103  
DAMPING = 0.000000  
DYNAMIC ANALYSIS
```

8. 103



```
ANALYSIS  
UNIT = 1000  
DISPLACEMENT  
STEP 1  
MODE = 8  
FREQUENCY = 103  
DAMPING = 0.000000  
DYNAMIC ANALYSIS  
STEP 1  
MODE = 8  
FREQUENCY = 103  
DAMPING = 0.000000  
DYNAMIC ANALYSIS
```

9. 310



```
ANALYSIS  
UNIT = 1000  
DISPLACEMENT  
STEP 1  
MODE = 9  
FREQUENCY = 310  
DAMPING = 0.000000  
DYNAMIC ANALYSIS  
STEP 1  
MODE = 9  
FREQUENCY = 310  
DAMPING = 0.000000  
DYNAMIC ANALYSIS
```

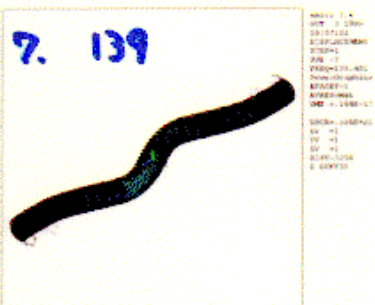
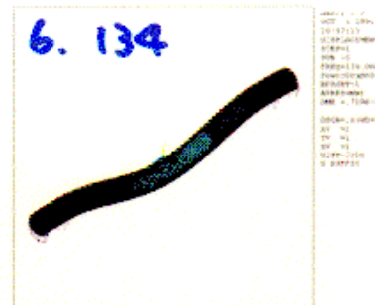
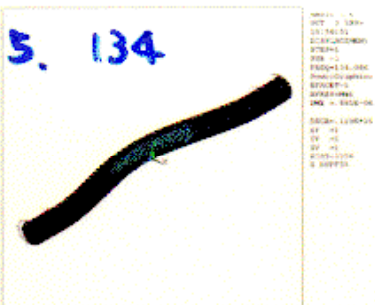
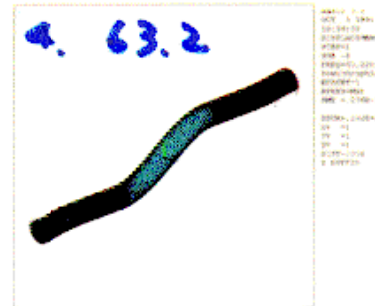
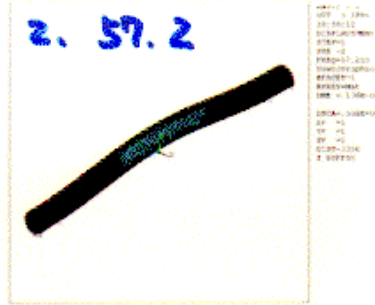
10: 310 Hz



```
ANALYSIS  
UNIT = 1000  
DISPLACEMENT  
STEP 1  
MODE = 10  
FREQUENCY = 310  
DAMPING = 0.000000  
DYNAMIC ANALYSIS  
STEP 1  
MODE = 10  
FREQUENCY = 310  
DAMPING = 0.000000  
DYNAMIC ANALYSIS
```

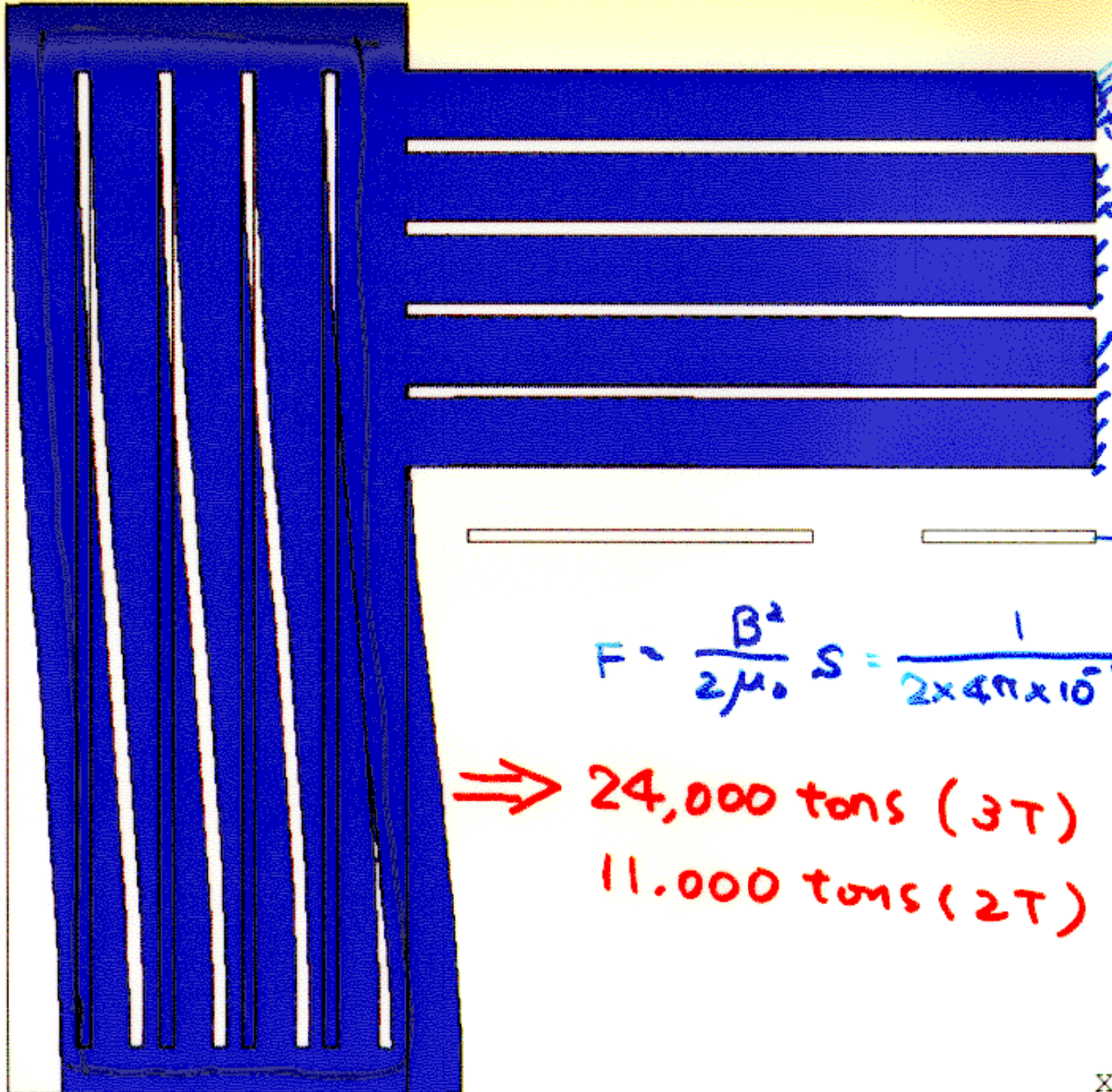


# 100Hz





1



$$F = \frac{B^2}{2\mu_0} S = \frac{1}{2 \times 4\pi \times 10^{-7}} \cdot \frac{\pi}{4} \times 9^2$$

⇒ 24,000 tons (3T)  
 11,000 tons (2T)

```

ANSYS 5.4
OCT 19 1999
13:06:29
DISPLACEMENT
STEP=1
SUB =6
TIME=1
PowerGraphics
EFACET=1
AVRES=Mat
DMX =62844

DSCA=.635E-05
ZV =1
*DIST=4.343
*XF =4.294
*YF =3.935
A-ZS=90
EDGE * 9^2
ELEMENTS
PowerGraphics
EFACET=1

ZV =1
*DIST=4.343
*XF =4.294
*YF =3.935
A-ZS=90
EDGE
  
```

