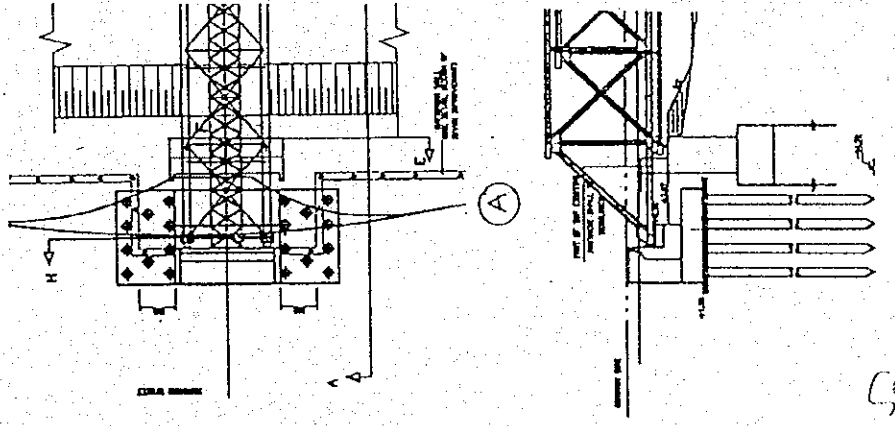
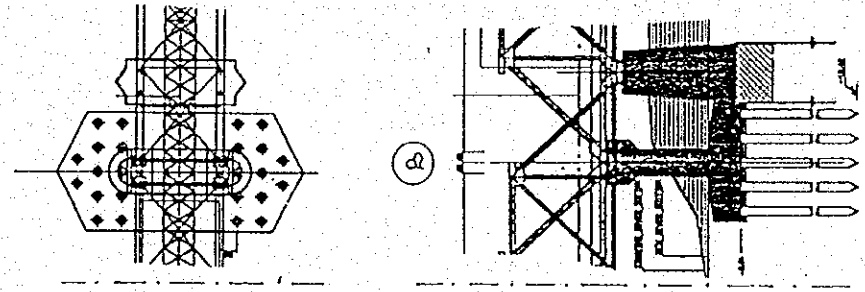
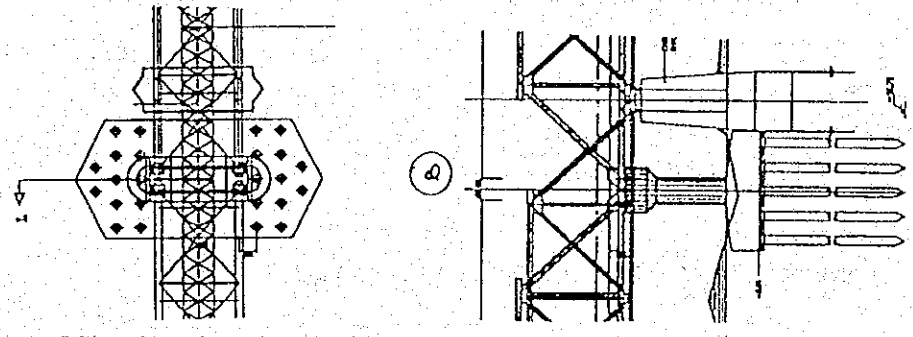
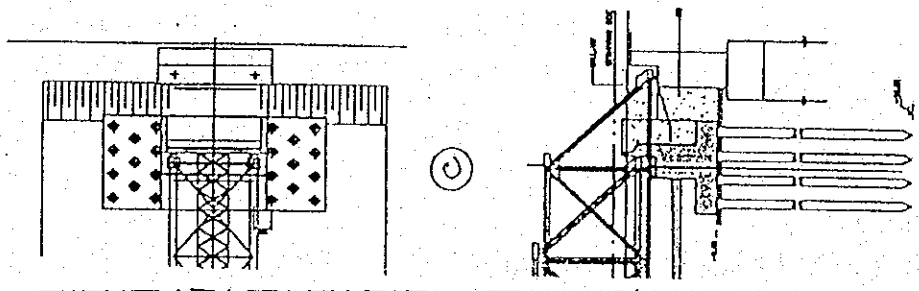


# 7.3 Abutment and Pier (Location: 1K+579m)

Project : Design of Railway Bridge Across West Flood  
 Line : Semarang - Cirebon  
 BH No. : 10 (Km. 01 + 577)  
 Span : 30.00 + 30.00 + 30.00 m

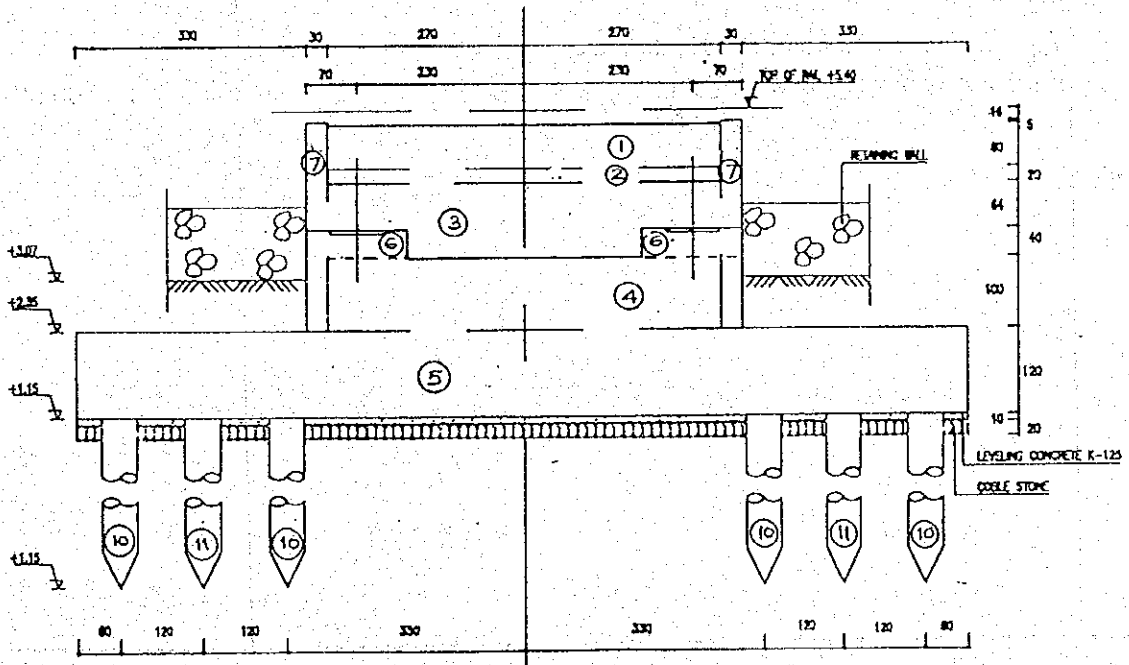
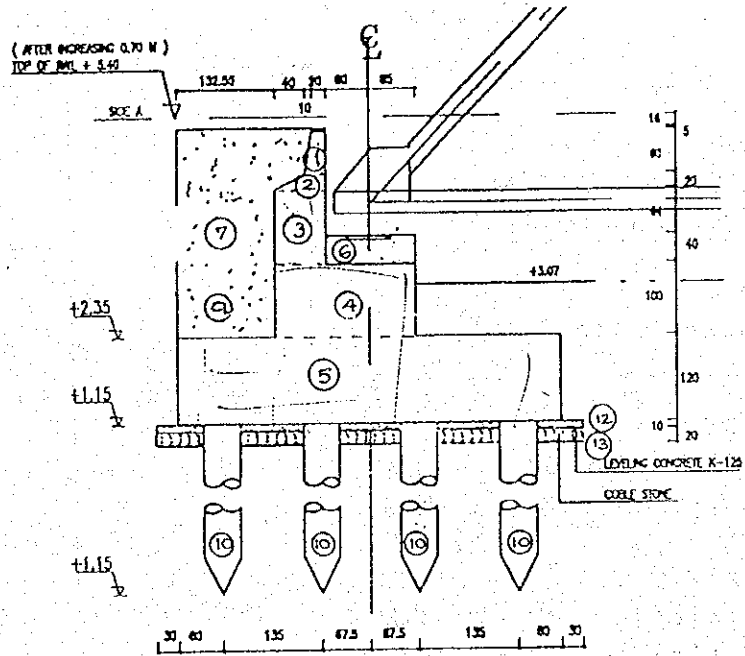


*Semarang*


Project : Design of Railway Bridge Across West Flood  
 Line : Semarang - Cirebon  
 BH No. : 10 (Km. 01 + 577)  
 Span : 30.00 + 30.00 + 30.00 m

| No.    | Calculation   | Total                                    |
|--------|---|--|
|        | Soil Excavation   |  |
|        | Demolishing   |  |
| △<br>A | Cirebon Side<br>Soil digging: $8 \times 12 \times 2,50 = 240 \text{ Cm}^3$<br>Abutment masonry = $1 \times 6 \times 2 = 12 \text{ M}^3$                   | 240 Cm <sup>3</sup><br>12 M <sup>3</sup> |
| △<br>B | Pier Cn and Sm Side<br>Digging = $2 \times 2 \times 8 \times 14 = 448 \text{ M}^3$<br>Pier masonry = $2 \times 5,8 \times 2,6 \times 5 = 151 \text{ M}^3$ | 448M3<br>151M3                           |
| △<br>C | Abutment Sm Side<br>Digging for abutment work = $10 \times 2,20 \times 13 = 286 \text{ M}^3$  | 286 M <sup>3</sup>                       |
| 14     | TOTAL   | 1.137 M <sup>3</sup>                     |

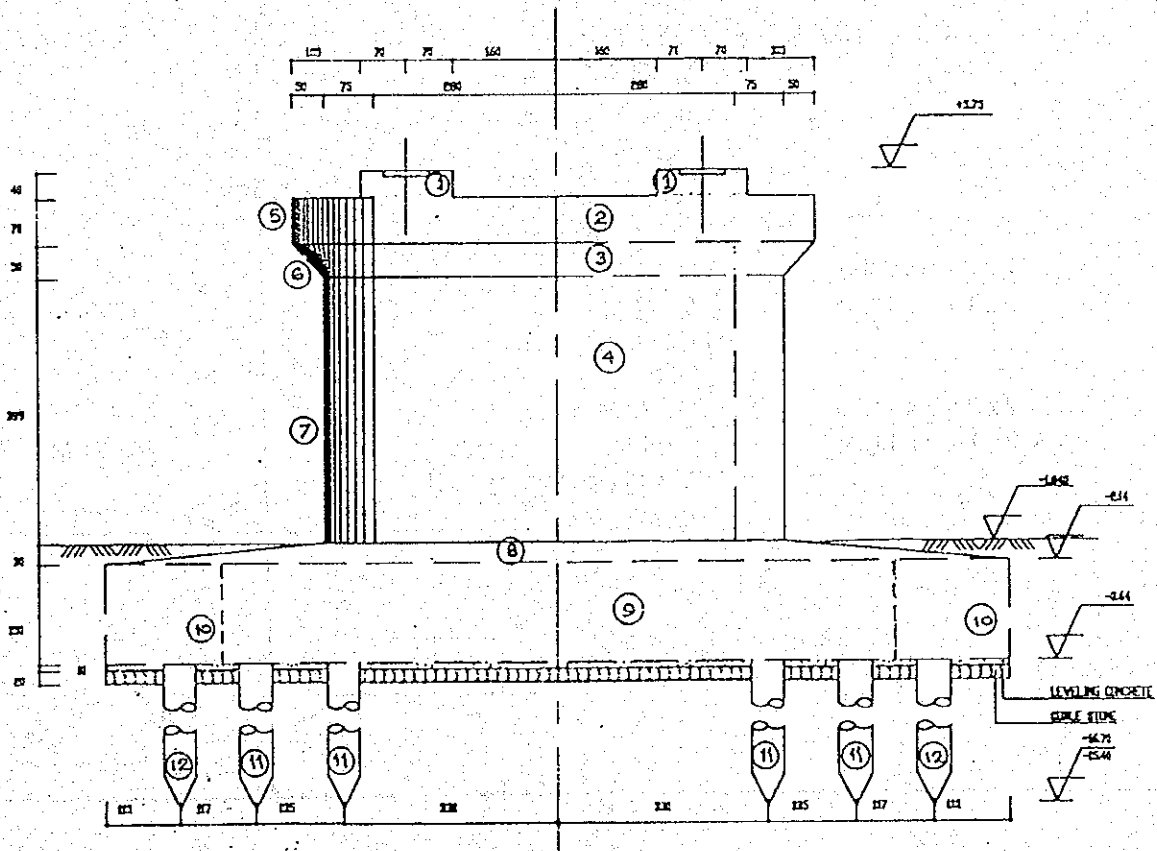
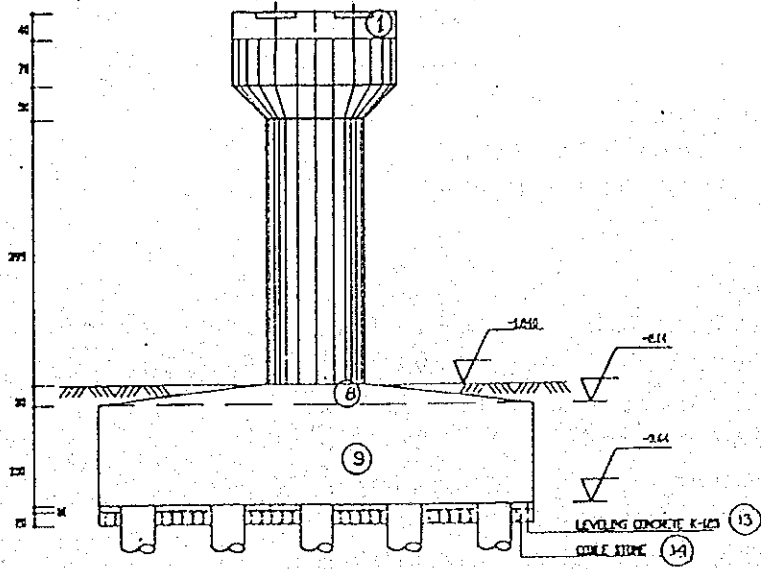
Project : Design of Railway Bridge Across West Flood  
 Line : Semarang - Cirebon  
 BH No. : 10 (Km. 01 + 577)  
 Span : 30.00 + 30.00 + 30.00 m



Project : Design of Railway Bridge Across West Flood  
 Line : Semarang - Cirebon  
 BH No. : 10 (Km. 01 + 577)  
 Span : 30.00 + 30.00 + 30.00 m

| No.   | Calculation  | Total                                     |
|---|--|---|
|   | Abutment Cirebon Side  |   |
|   | Leveling concrete<br>$V_{12} = 0,1 \times 5,85 \times 12,6 = 7,371 \text{ M}^3$<br>$V_{13} = 0,2 \times 5,85 \times 12,6 = 14,742 \text{ M}^3$   | 7,371 $\text{M}^3$<br>14,742 $\text{M}^3$ |
|  | Cobble stone<br>$= 2,84 \times 1,32 \times 4,60 = 17,42 \text{ M}^3$   | 17,42 $\text{M}^3$                        |
|   | Abutment Cn Side<br>$V_1 = (0,2 + 0,3) \times 0,5 \times 0,6 \times 5,4 = 0,810 \text{ M}^3$<br>$V_2 = (0,3 + 0,7) \times 0,5 \times 0,2 \times 5,4 = 0,540 \text{ M}^3$<br>$V_3 = 0,6 \times 1,04 \times 5,4 = 3,370 \text{ M}^3$<br>$V_4 = 1,95 \times 1 \times 5,4 = 10,530 \text{ M}^3$<br>$V_5 = 5,25 \times 1,2 \times 12,60 = 79,380 \text{ M}^3$<br>$V_6 = 2 \times 1,25 \times 0,4 \times 1,4 = 1,400 \text{ M}^3$<br>$V_7 = 2 \times 2,025 \times 2,89 \times 0,3 = 3,510 \text{ M}^3$<br>$= 99,540 \text{ M}^3$ | 99,540 $\text{M}^3$                       |
|   | Pile<br>$V_{10} = 2 \times 4 \times 2 \times 10,45 \text{ M}^1 = 167,20 \text{ M}^1$<br>$V_{11} = 2 \times 2 \times 2 \times 10,45 \text{ M}^1 = 41,80 \text{ M}^1$<br>$= 209,00 \text{ M}^1$  | 209,00 $\text{M}^1$                       |
| 16  |  |   |

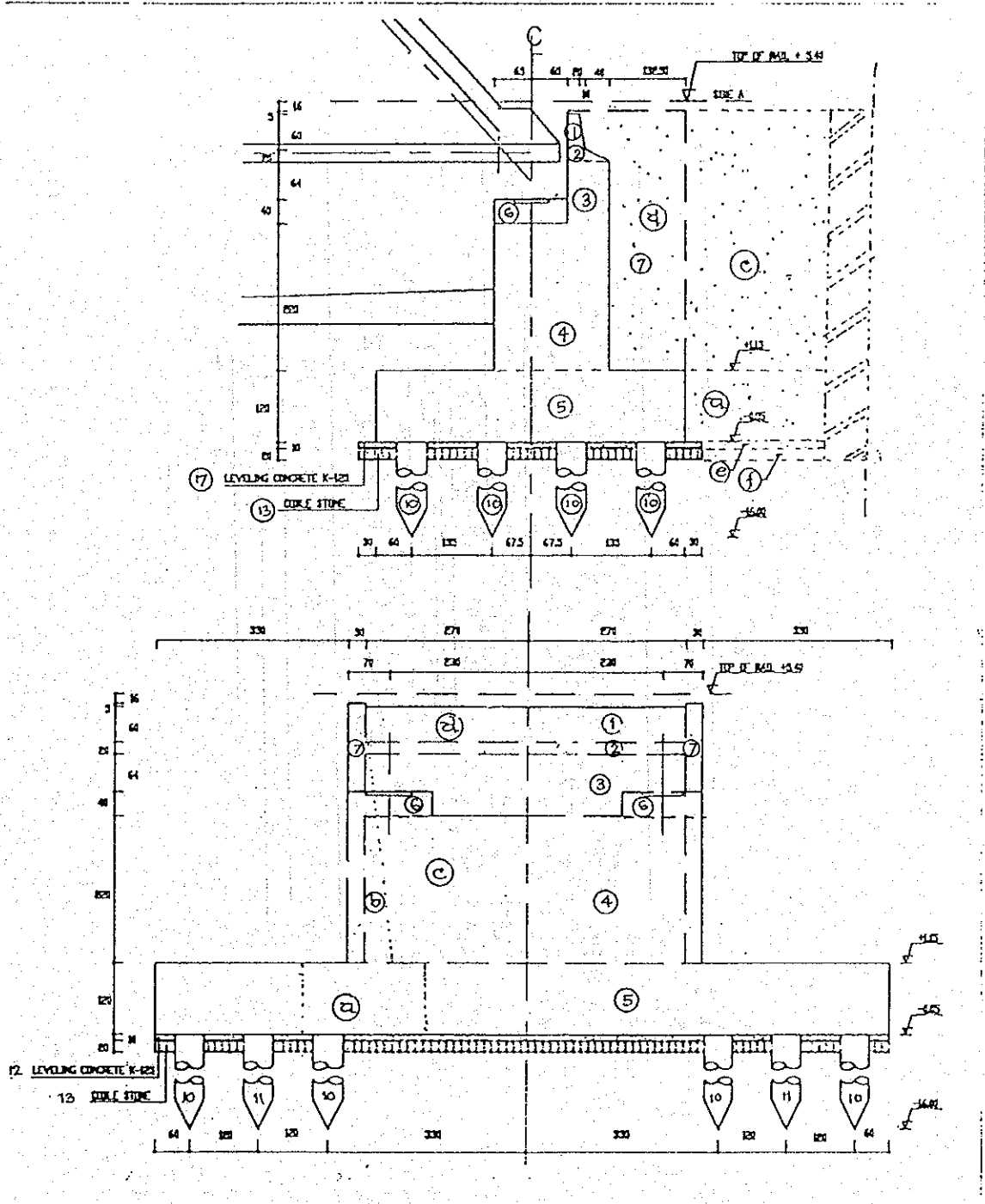
Project : Design of Railway Bridge Across West Flood  
 Line : Semarang - Cirebon  
 BH No. : 10 (Km. 01 + 577)  
 Span : 30.00 + 30.00 + 30.00 m



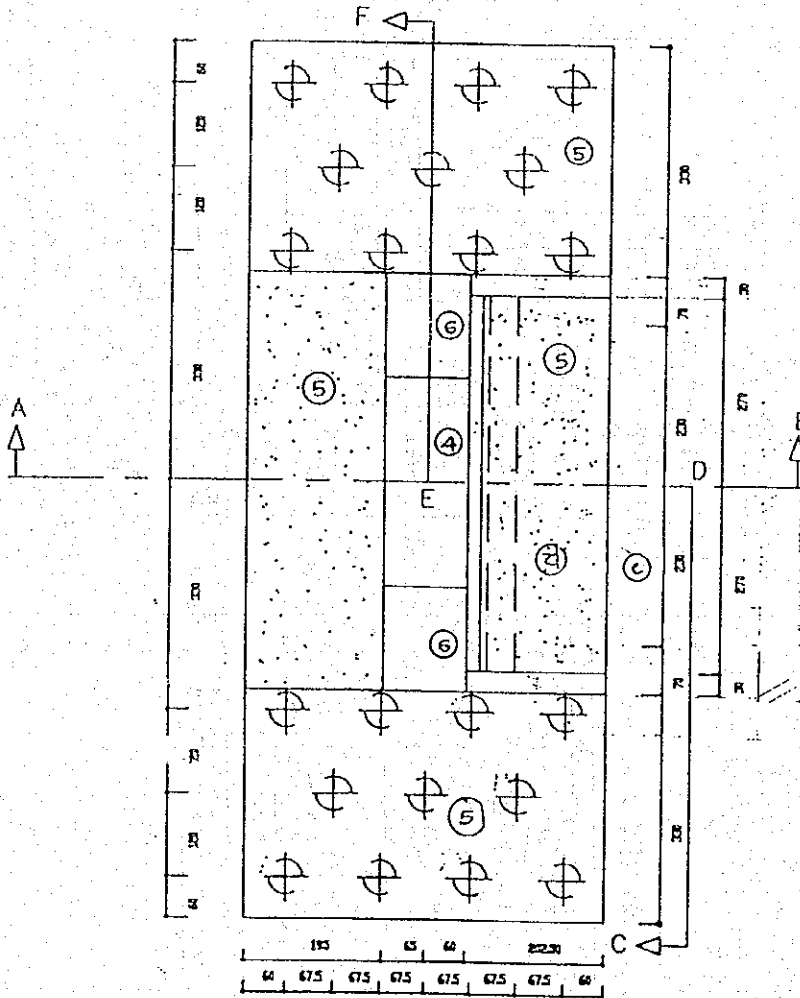
Project : Design of Railway Bridge Across West Flood  
 Line : Semarang - Cirebon  
 BH No. : 10 (Km. 01 + 577)  
 Span : 30.00 + 30.00 + 30.00 m

| No.  | Calculation  | Total                                       |
|------|--|---|
|      | Leveling concrete<br>$V_{13} = 0,1 \times 6,6 \times 11,90 = 7,85 \text{ M}^3$<br>$V_{14} = 0,2 \times 6,6 \times 11,90 = 15,70 \text{ M}^3$   | 7,85 M <sup>3</sup><br>15,70 M <sup>3</sup> |
|      | Pier I = II<br>$V_1 = 2 \times 1,4 \times 2,7 \times 0,4 = 3,042 \text{ M}^3$<br>$V_2 = 5,6 \times 2,5 \times 0,7 = 9,800 \text{ M}^3$<br>$V_3 = 0,5 (5,6 \times 2,5 + 5,6 \times 1,5) = 5,500 \text{ M}^3$<br>$V_4 = 5,6 \times 3,99 \times 1,5 = 33,516 \text{ M}^3$<br>$V_5 = 2 \times 0,7 \times 3,14 \times 1,25^2 = 6,869 \text{ M}^3$<br>$V_6 = 0,5 (3,14 \times (1,25 + 0,752)) \times 0,5 = 3,336 \text{ M}^3$<br>$V_7 = 2 \times 3,14 \times 0,75^2 \times 3,99 = 14,095 \text{ M}^3$<br>$V_8 = 0,5 (5,6 \times 1,5 + 2 \times 3,14 \times 0,75^2 + 9,9 \times 6,6 + 0,5 \times 6,6 \times 2) \times 0,3 = 12,580 \text{ M}^3$<br>$V_9 = 9,9 \times 1,5 \times 6,6 = 98,10 \text{ M}^3$<br>$V_{10} = 2 \times 0,5 \times 6,6 \times 2 \times 1,5 = 19,800 \text{ M}^3$<br>= 206,530 M <sup>3</sup> | 206,530 M <sup>3</sup>                      |
| Pile |  |   |
|      | $V_{11} = 2 \times 2 \times 5 \times 13,06 = 261,2 \text{ M}$<br>$V_{12} = 2 \times 1 \times 2 \times 13,06 = 52,24 \text{ M}$<br>= 313,44 M (Cirebon Side)  | 313,44 M                                    |
|      | $V_{11} = 2 \times 2 \times 5 \times 11,76 = 235,20 \text{ M}$<br>$V_{12} = 2 \times 1 \times 2 \times 11,76 = 47,04 \text{ M}$<br>= 282,24 M (Semarang Side)  | 282,24 M                                    |
| 18   |  | 1825  |

Project : Design of Railway Bridge Across West Flood  
 Line : Semarang - Cirebon  
 BH No. : 10 (Km. 01 + 577)  
 Span : 30.00 + 30.00 + 30.00 m





Project : Design of Railway Bridge Across West Flood  
 Line : Semarang - Cirebon  
 BH No. : 10 (Km. 01 + 577)  
 Span : 30.00 + 30.00 + 30.00 m





Project : Design of Railway Bridge Across West Flood  
 Line : Semarang - Cirebon  
 BH No. : 10 (Km. 01 + 577)  
 Span : 30.00 + 30.00 + 30.00 m

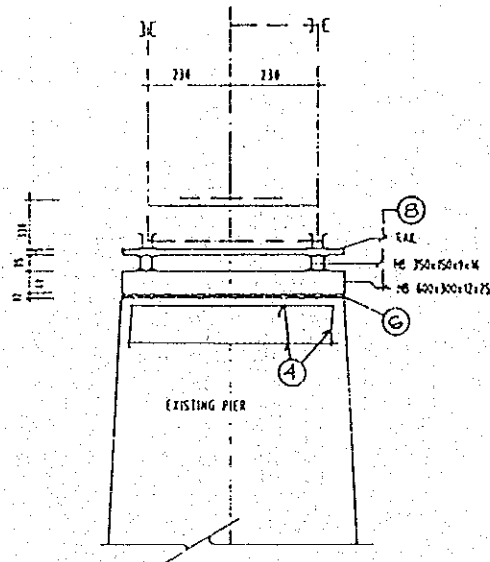
| No.   | Calculation  | Total                                    |
|---|--|--|
|   | Ballast box connector  |  |
|  | Foundation = $2 \times 1,75 \times 2,2 \times 1,2 = 9,24 \text{ M}^3$  | 9,24 M <sup>3</sup>                      |
|  | Cobble stone = $0,5 (5,4 + 4,5) \times 3,6 \times 3,5 = 62,37 \text{ M}^3$   | 62,37 M <sup>3</sup>                     |
|   | e = $2 \times 0,1 \times 0,2 \times 1,75 = 0,7 \text{ M}^3$<br>j = $2 \times 0,2 \times 2,0 \times 1,75 = 1,4 \text{ M}^3$   | 0,7 M <sup>3</sup><br>1,4 M <sup>3</sup> |
|   | Abutment Sm Side<br>$V_1 = (0,2 + 0,3) \times 0,5 \times 0,6 \times 5,4 = 0,810 \text{ M}^3$<br>$V_2 = (0,3 + 0,6) \times 0,5 \times 0,2 \times 5,4 = 0,486 \text{ M}^3$<br>$V_3 = 0,6 \times 1,04 \times 5,4 = 3,370 \text{ M}^3$<br>$V_4 = 1,95 \times 2,2 \times 5,4 = 23,166 \text{ M}^3$<br>$V_5 = 5,25 \times 12,60 \times 1,2 = 79,380 \text{ M}^3$<br>$V_6 = 2 \times 1,25 \times 0,4 \times 1,4 = 1,400 \text{ M}^3$<br>$V_7 = 2 \times 2,025 \times 4,09 \times 0,3 = 4,969 \text{ M}^3$<br><u>113,501 M<sup>3</sup></u> | 113,501 M <sup>3</sup>                   |
|   | Pile<br>$V_{10} = 2 \times 4 \times 2 \times 17,20 = 275,20 \text{ M}$<br>$V_{11} = 2 \times 3 \times 1 \times 17,20 = 103,20 \text{ M}$<br><u>378,40 M</u>  | 378,40 M                                 |
|   | Leveling<br>$V_{12} = 0,10 \times 12,6 \times 5,85 = 7,371 \text{ M}$<br>$V_{13} = 0,20 \times 12,6 \times 5,85 = 14,742 \text{ M}$<br><u>22,113 M</u>   | 22,113 M                                 |
|   |  |  |

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Project : Design of Railway Bridge Across West Flood  
 Line : Semarang - Cirebon  
 BH No. : 10 (Km. 01 + 577)  
 Span : 30.00 + 30.00 + 30.00 m

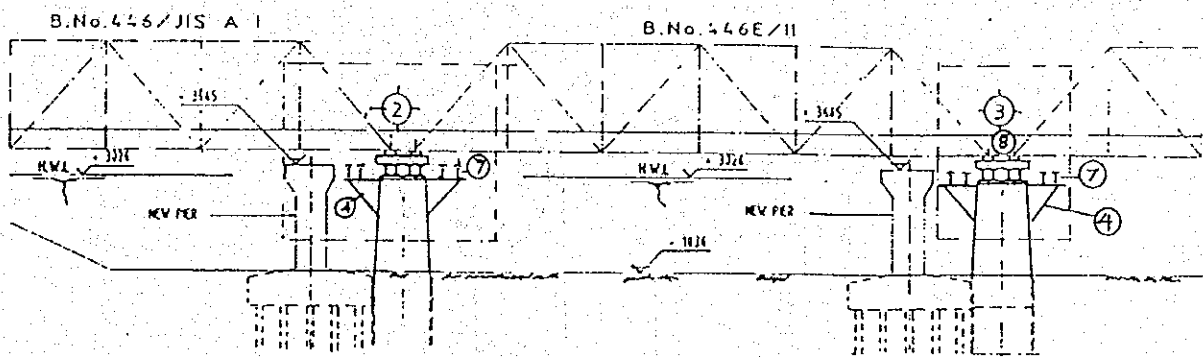
| No. | Calculation  | Total                  |
|-----|--|------------------------|
|     | Recapitulation   |                        |
| 1   | Leveling concrete<br>- Abutment Cirebon Side = 7.371 M3<br>= 14.742 M3<br>- Pier Cirebon Side = 7.850 M3<br>= 15.700 M3<br>- Pier Semarang Side = 7.850 M3<br>= 15.700 M3<br>- Abutment Semarang Side = 7.371 M3<br>= 14.742 M3<br>Total = 91.326 M3 | 91.326 M <sup>3</sup>  |
| 2   | Concrete K. 225  |                        |
|     | - Abutment Cirebon Side = 99.540 M3<br>- Pier Cirebon Side = 206.530 M3<br>- Pier Semarang Side = 206.530 M3<br>- Abutment Semarang = 113.501 M3<br>Total = 626.101 M3   | 626.101 M <sup>3</sup> |
| 3   | Pile   |                        |
|     | - Abutment Cirebon Side = 209.00<br>- Pier Cirebon Side = 313.44<br>- Pier Semarang Side = 284.24<br>- Abutment Semarang Side = 378.40<br>Total = 1183.00 M  | 1183.00 M              |
|     |  |                        |

Project : Design of Railway Bridge Across West Flood  
Line : Semarang - Cirebon  
BH No. : 10 (Km. 01 + 577)  
Span : 30.00 + 30.00 + 30.00 m

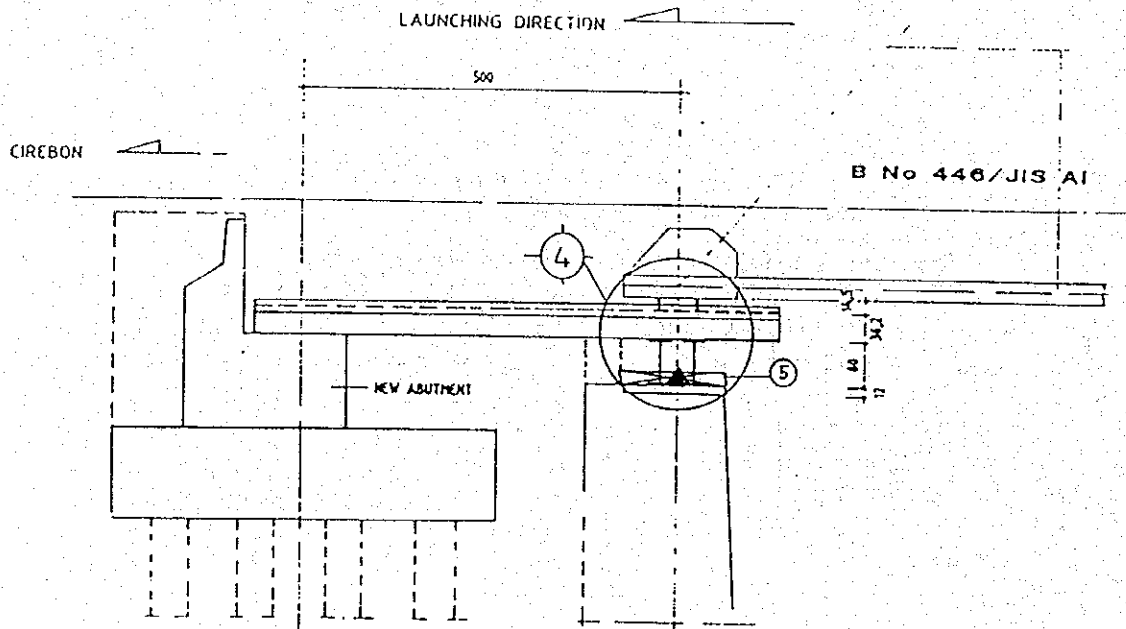
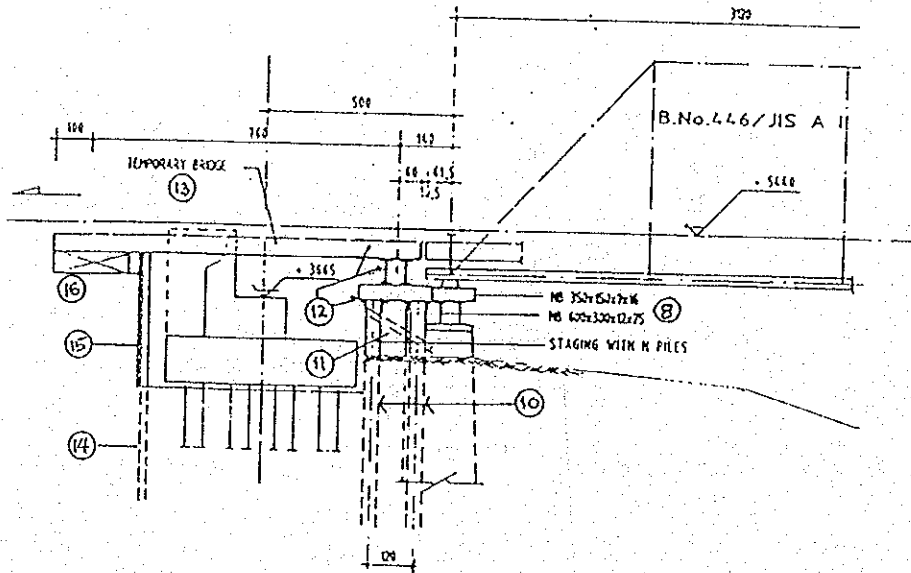


SECTION C - D

SCALE 1: 50

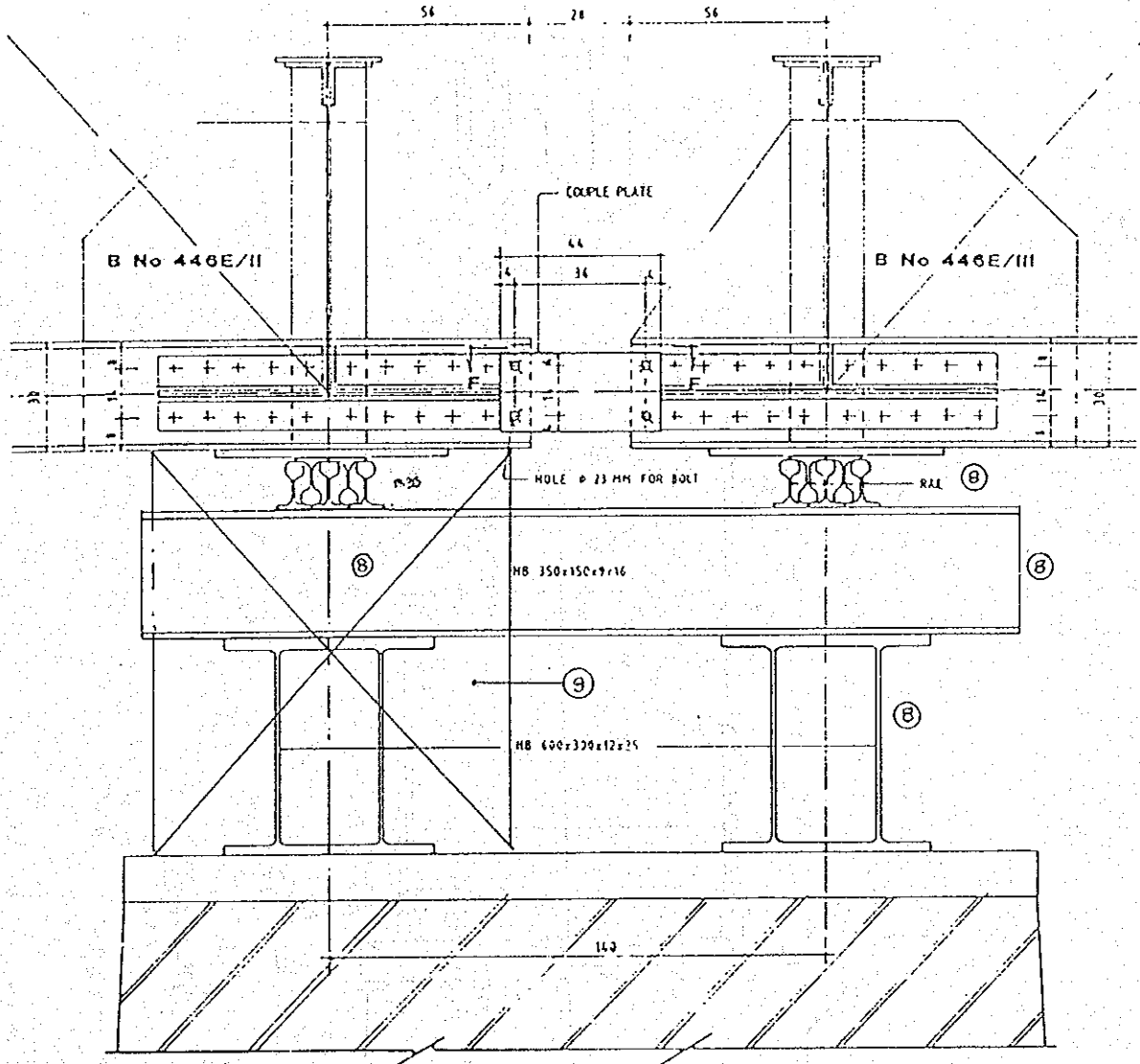


Project : Design of Railway Bridge Across West Flood  
 Line : Semarang - Cirebon  
 BH No. : 10 (Km. 01 + 577)  
 Span : 30.00 + 30.00 + 30.00 m



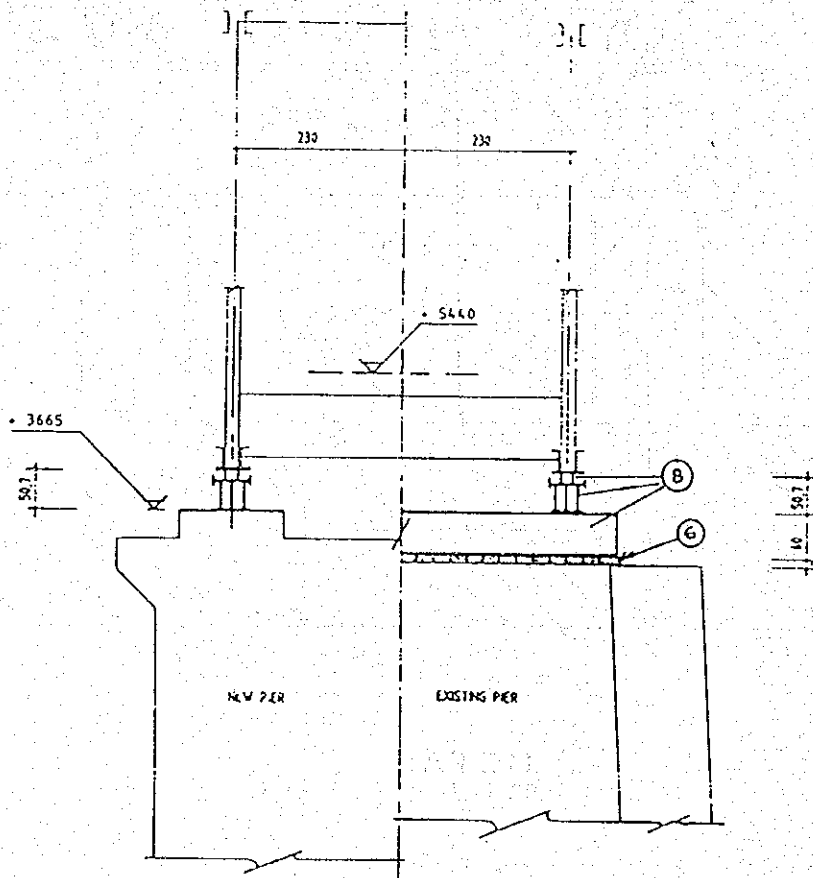
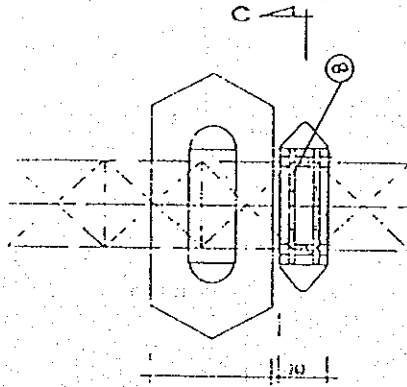
**SIDE VIEW CIREBON**  
 SCALE 1 : 50

Project : Design of Railway Bridge Across West Flood  
 Line : Semarang - Cirebon  
 BH No. : 10 (Km. 01 + 577)  
 Span : 30.00 + 30.00 + 30.00 m



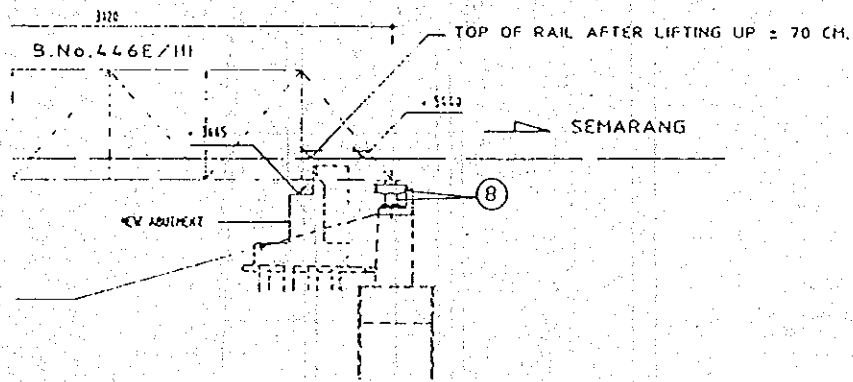
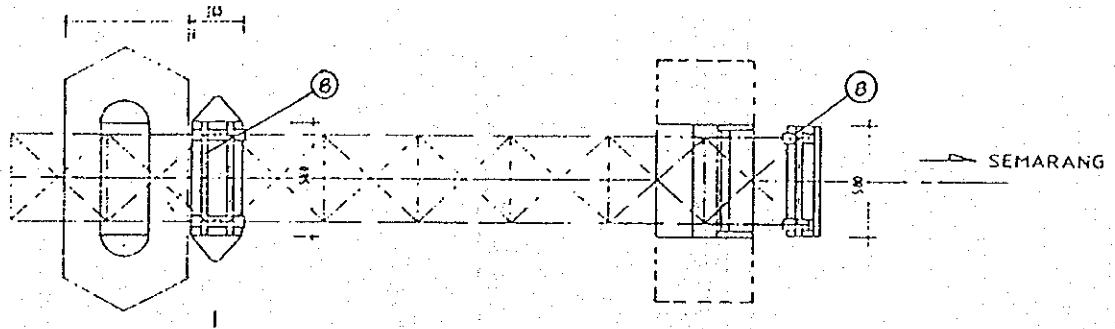
**DETAIL** — (3)  
 SCALE 1 : 10

Project : Design of Railway Bridge Across West Flood  
 Line : Semarang - Cirebon  
 BH No. : 10 (Km. 01 + 577)  
 Span : 30.00 + 30.00 + 30.00 m

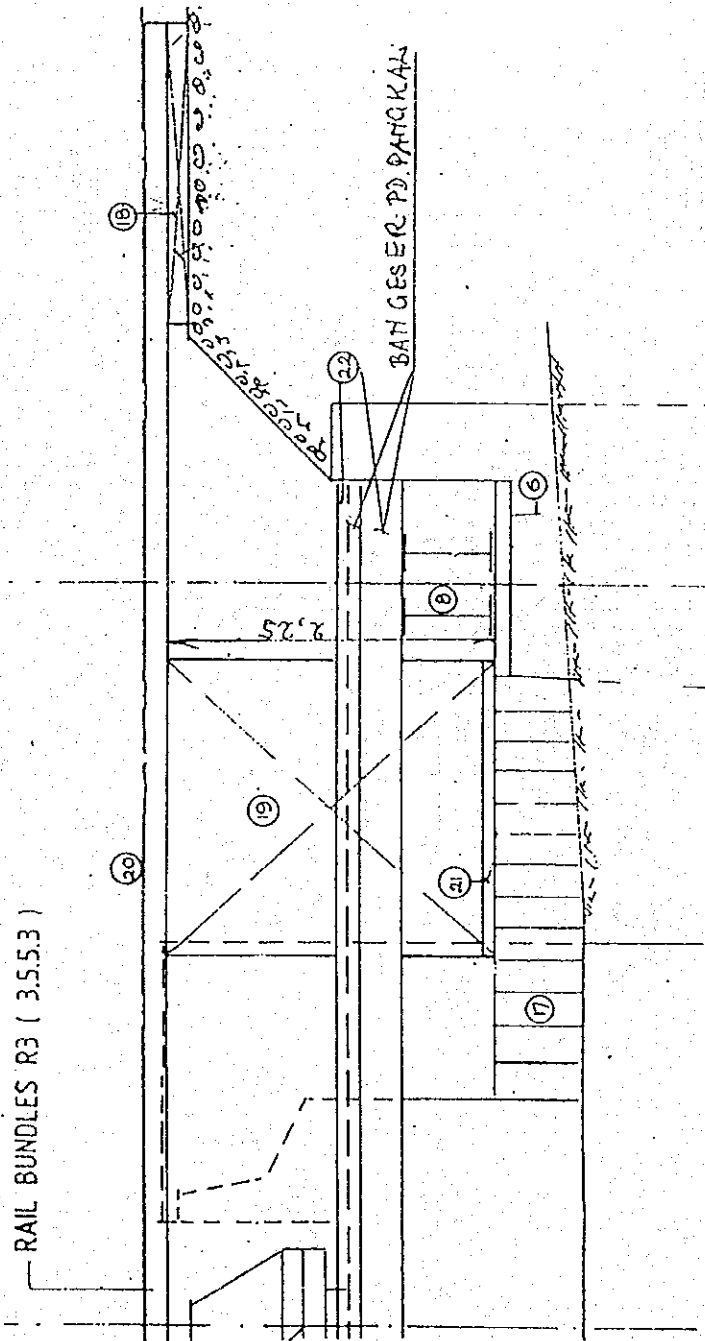


**CROSS SECTION**  
 SCALE 1 : 50

Project : Design of Railway Bridge Across West Flood  
 Line : Semarang - Cirebon  
 BH No. : 10 (Km. 01 + 577)  
 Span : 30.00 + 30.00 + 30.00 m

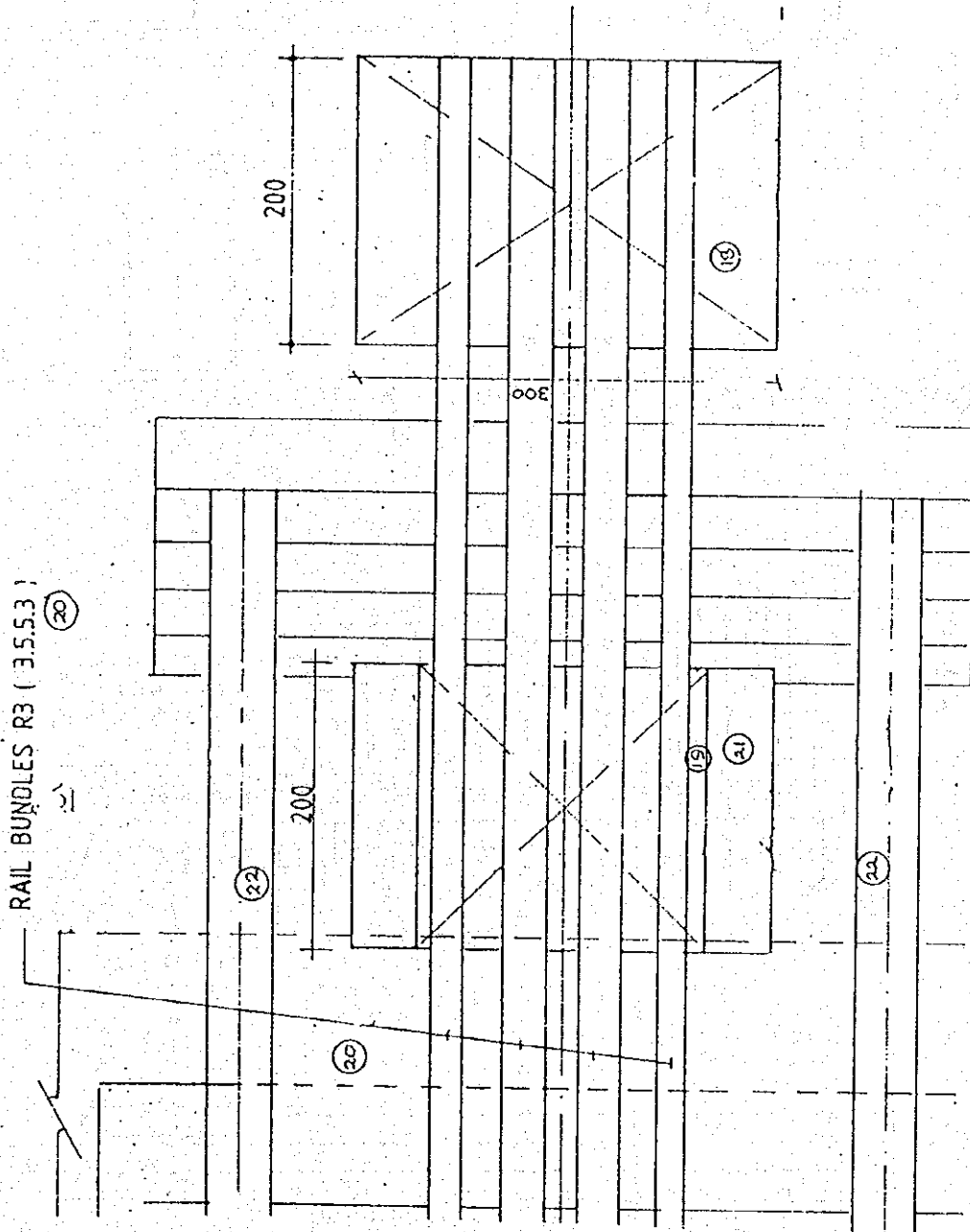


Project : Design of Railway Bridge Across West Flood  
Line : Semarang - Cirebon  
BH No. : 10 (Km. 01 + 577)  
Span : 30.00 + 30.00 + 30.00 m

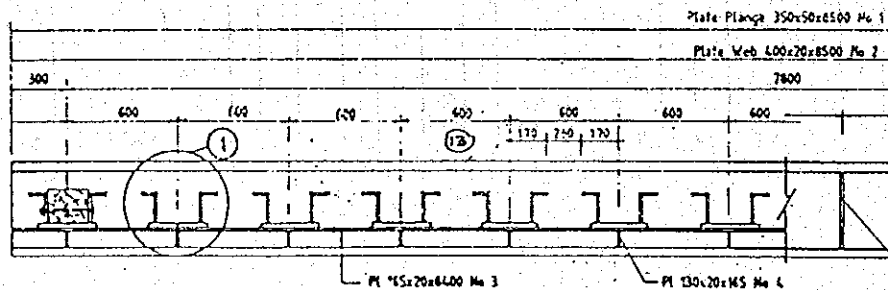
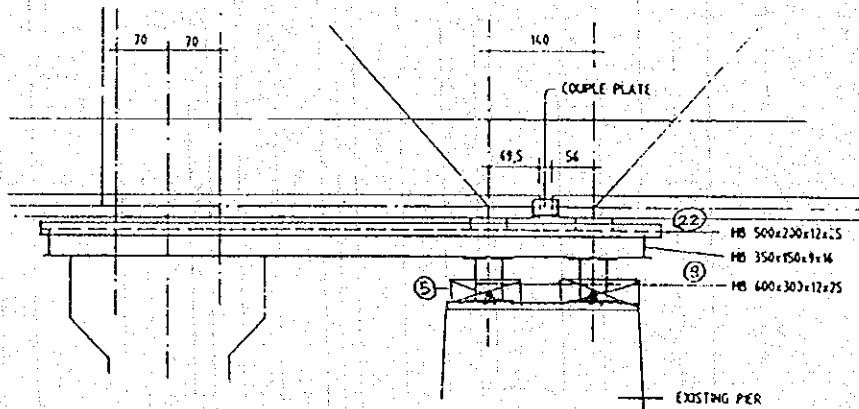
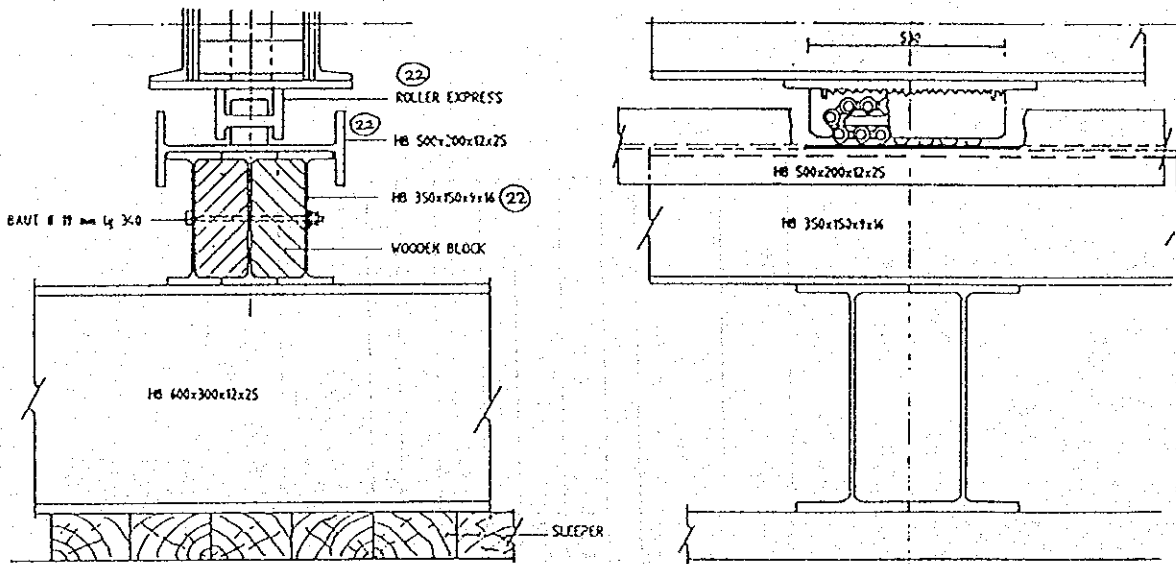




Project : Design of Railway Bridge Across West Flood  
Line : Semarang - Cirebon  
BH No. : 10 (Km. 01 + 577)  
Span : 30.00 + 30.00 + 30.00 m



Project : Design of Railway Bridge Across West Flood  
 Line : Semarang - Cirebon  
 BH No. : 10 (Km. 01 + 577)  
 Span : 30.00 + 30.00 + 30.00 m



Project : Design of Railway Bridge Across West Flood  
 Line : Semarang - Cirebon  
 BH No. : 10 (Km. 01 + 577)  
 Span : 30,00 + 30,00 + 30,00 m

| No. | Calculation  | Total                           |
|-----|--|---------------------------------|
|     | PLAT FORM including the materials  |                                 |
| 4   | At pier No. 2 = 2 Unit    Abutment Cn Side = 1 Unit<br>At pier No. 3 = 2 Unit    Abutment Sm Side = 1 Unit   | 6 Unit                          |
|     | Remove the bearing steel   |                                 |
| 5   | At Cn side abutment = 2 Pieces = $1/2 \times 3 \times 2 \times 2 = 6$ Bars<br>At pier No. 2 Cm side = 4 Pieces = $1/2 \times 3 \times 2 \times 4 = 12$ Bars<br>At pier No. 3 Cm side = 4 Pieces = $1/2 \times 3 \times 2 \times 4 = 12$ Bars<br>At Sm side abutment = 2 Pieces = $1/2 \times 3 \times 2 \times 4 = 6$ Bars   | 12 Pieces<br>36 Bars            |
|     | Sleeper matress above pier / abutment  |                                 |
| 6   | At Cn side abutment = $1 \times 5,8 = 5,8$ m <sup>2</sup><br>At pier No. 2 = $2,6 \times 5,8 = 15,08$ m <sup>2</sup><br>At pier No. 3 = $2,6 \times 5,8 = 15,08$ m <sup>2</sup><br>Sleeper = $26 + 1/2 \times 26 + 1/2 \times 26 + 26 = 78$ Bars   | 41,76 m <sup>2</sup><br>78 Bars |
|     | Preparing cross supporter  |                                 |
| 7   | Before It's set, cross supporter prepared in front of pier / abutment on the platform  |                                 |
| 8   | - Cn side abutment<br>HB. 600 x 300 x 12 x 15, Length 5,8 m x 2 Bars x 0,177 Ton = 2,053 Ton<br>HB. 300 x 150 x 9 x 16, Length 1,30 m x 4 Bars x 0,0774 Ton = 0,403 Ton<br>R33 rail, Length 5,8 m x 5 Bars x 0,033 Ton = 0,957 Ton<br>3,413 Ton<br><br>- At pier No. 2<br>HB. 600 x 300 x 12 x 25, Length 5,8 m x 4 Bars x 0,177 Ton = 4,106 Ton<br>HB. 350 x 150 x 9 x 16, Length 2,60 m x 4 Bars x 0,0774 Ton = 0,805 Ton<br>R33 rail, Length 5,8 m x 5 Bars x 0,033 Ton x 2 = 1,914 Ton<br>6,825 Ton<br><br>- At pier No. 3 = pier No. 2 = 6,825 Ton<br>- At Sm side abutment = Cm side = 3,413 Ton | 20,476 Ton                      |

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Project : Design of Railway Bridge Across West Flood  
 Line : Semarang - Cirebon  
 BH No. : 10 (Km. 01 + 577)  
 Span : 30.00 + 30.00 + 30.00 m

| No. | Calculation   | Total                   |
|-----|---|-------------------------|
|     | Bridge raising for 70 Cm height   |                         |
| 9   | Implemented in 6 steps<br>If's needed the sleeper :<br>- At abutment $2 \times 1/2 \text{ Bar} \times 4 \text{ Layer} \times 3 \text{ Rows} \times 2 = 24 \text{ Bars}$<br>$2 \times 1 \text{ Bar} \times 4 \text{ Layer} \times 3 \text{ Rows} \times 2 = 48 \text{ Bars}$<br>- At pier $2 \times 1/2 \text{ Bar} \times 4 \text{ Layer} \times 3 \text{ Rows} \times 4 = 48 \text{ Bars}$<br>$2 \times 1 \text{ Bar} \times 4 \text{ Layer} \times 3 \text{ Rows} \times 4 = 96 \text{ Bars}$ | 6 Steps<br><br>206 Bars |
|     | Piling HB. 400 x 300 x 12 x 15  |                         |
| 10  | 10a. Pile, Length 8 m x 4 Bars x 0,152 Ton = 4,864 Ton<br>10b. Pile, Length 8m x 4 Bars x 0,152 Ton = 4,864 Ton   | 8 Bars<br>9,728 Ton     |
|     | Setting steel stiffener   |                         |
| 11  | $11^a + 11^b = \text{LS. } 100 \times 100 \times 10, \text{ Length } 2\text{m} \times 4 \text{ Bars} \times 2 \times 0,0151 \text{ Ton}$  | 0,242 Ton               |
|     | Setting cross girder  |                         |
| 12  | 12a HB. 600 x 300 x 12 x 25, Length 10 M x 2 Bars x 0,177 Ton = 3,54 Ton<br>12b HB. 400 x 300 x 12 x 25, Length 2 M x 4 Bars x 0,152 Ton = 1,216 Ton  | 4,756 Ton               |
|     | Temporary bridge  |                         |
| 13  | Appropriate with weight list in the main drawing  | 10,559 Ton              |
|     | Rail piling for bulkhead  |                         |
| 14  | Rail piling for strenghten the bulkhead   | 2 Pieces                |

| Project : Design of Railway Bridge Across West Flood<br>Line : Semarang - Cirebon<br>BH No. : 10 (Km. 01 + 577)<br>Span : 30.00 + 30.00 + 30.00 m |  |                      |
|---|--|----------------------|
| No.   | Calculation  | Total                |
|   | Setting the bulkhead   |                      |
| 15  | Consist of wooden plate size 8 x 12 x 300 Cm,<br>Height 3,5 m = $0,08 \times 3 \times 3,5 = 0,84 \text{ m}^3$  | 0,84 m <sup>3</sup>  |
|   | Construct temporary abutment   |                      |
| 16  | Temporary abutment for temporary bridge<br>Sleeper = $14 + 6 \times 3 = 32 \text{ Bars}$   | 1 Piece<br>32 Bars   |
|   | Fill work  |                      |
| 17  | Made for sleeper mattress base of rail bundles -<br>support = $0,6 \times 2,8 \times 5 = 8,4 \text{ m}^3$  | 8,4 m <sup>3</sup>   |
|   | Temporary abutment   |                      |
| 18  | Made for rail bundles position = 1 Piece<br>Sleeper = $15 + 6 = 21 \text{ Bars}$   | 1 Piece<br>21 Bars   |
|   | Sleeper mattress for rail bundles  |                      |
| 19  | Made for supporting in the middle of rail bundles, height= 2,25 M<br>Sleeper = $3 \times 17 \text{ Layer} = 51 \text{ bars}$                                       | 2,25 M<br>51 Bars    |
|   | Rail Bundles   |                      |
| 20  | Consist of 10 m length of R3, for 16 Bars<br>Weight = $16 \times 10 \times 0,033 \text{ Ton} = 5,280 \text{ Ton}$<br>Become 4 lines = $3 + 5 + 5 + 3 \text{ bars}$ | 4 Lines<br>5,280 Ton |
| 33  |  |                      |

Project : Design of Railway Bridge Across West Flood  
 Line : Semarang - Cirebon  
 BH No. : 10 (Km. 01 + 577)  
 Span : 30.00 + 30.00 + 30.00 m

| No. | Calculation  | Total                       |
|-----|--|-----------------------------|
|     | Setting sleeper mattress   |                             |
| 21  | For base stapling of rail bindles<br>Sleeper = 14 Bars = 2 x 3 m = 6 m <sup>2</sup>  | 14 Bars<br>6 m <sup>2</sup> |
|     | Construct shifting tire  |                             |
| 22  | Shifting tire made from HB.<br>At Sm side abutment = 2 Unit<br>HB. 350 x 150 x 9 x 16, Length 7 m x 3 Bars x 2 = 3,251 Ton<br>HB. 500 x 200 x 12 x 25, Length 7 m x 1 Bar x 2 = 1,785 Ton<br>At Pier I = 2 Unit<br>HB. 350 x 150 x 9 x 16, Length 8 m x 3 Bars x 2 = 3,751 Ton<br>HB. 500 x 200 x 12 x 25, Length 8 m x 1 Bar x 2 = 2,041 Ton<br>At Pier II = 2 Unit = 5,756 Ton<br>At Cn side abutment = 2 Unit = 5,036 Ton | 8 Unit<br><br>21,584 Ton    |

| Name of Structure | RAILWAY BRIDGE<br>BH.13 | Category of calculation | WORK VOLUME | Page |
|-------------------|-------------------------|-------------------------|-------------|------|
|-------------------|-------------------------|-------------------------|-------------|------|

7.4 Abutment (Location : 2K+332 m)

**SUMMARY OF WORK VOLUME**

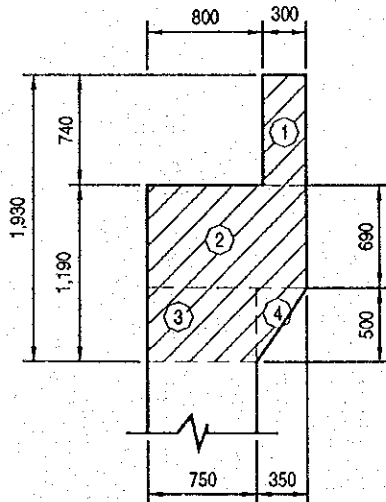
|  |   |                   |
|--|---|-------------------|
| 1. STRUCTURE EXCAVATION                | = | 53 m <sup>3</sup> |
| 2. DEMOLITION EXISTING STRUCTURE       | = | 18 m <sup>3</sup> |
| 3. BACK FILL                           | = | 90 m <sup>3</sup> |
| 4. RAISING WITH NEW CONCRETE           | = | 28 m <sup>3</sup> |
| 5. REINFORCING BAR                     | = | 3,468 kg          |
| 6. TEMPORARY SUPPORT                   | = | LS.               |
| 7. RAISING OF EXISTING UPPER STRUCTURE | = | LS.               |

| Name of Structure | RAILWAY BRIDGE<br>BH.13 | Category of calculation | WORK VOLUME | Page |
|-------------------|-------------------------|-------------------------|-------------|------|
|-------------------|-------------------------|-------------------------|-------------|------|

1. STRUCTURE EXCAVATION

$$v = 2 \times \frac{2.43 \times 2.43}{2} \times 8.93 = 52.73 \text{ m}^3$$

2. DEMOLITION OF EXISTING STRUCTURE (CONCRETE)



(a) Abutment

$$\textcircled{1} = 0.74 \times 0.30 = 0.222$$

$$\textcircled{2} = 1.10 \times 0.69 = 0.759$$

$$\textcircled{3} = 0.50 \times 0.75 = 0.375$$

$$\textcircled{4} = \frac{0.35 \times 0.50}{2} = 0.0875$$

$$1.4435 \text{ m}^2$$

$$V_a = 2 \times 1.4435 \times 4.50 = 12.992 \text{ m}^3$$

(b) Wing Wall

$$V_w = 2 \times 2 \times \left( 2.5 \times 1.93 - \frac{1.1 \times 1.1}{2} \right) \times 0.3 = 5.06 \text{ m}^3$$

$$\text{Total (a) + (b) = 18.05 m}^3$$

3. BACK FILL

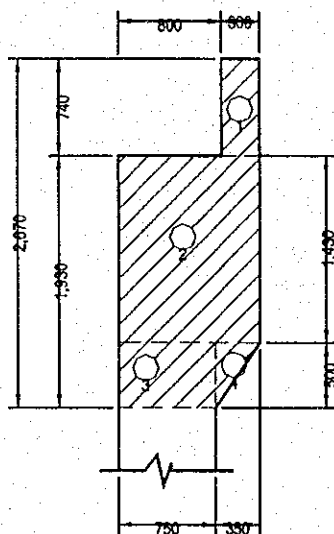
$$v = 2 \times \frac{3.17 \times 3.17}{2} \times 8.93 = 89.74 \text{ m}^3$$

4. TEMPORARY SUPPORT = LS.

- Number of piles (coconut threes) =  $9 \times 4 = 36$  nos.
- Length of piles = 5.00 m

5. RAISING OF EXISTING BRIDGE (UPPER STRUCTURE) = LS.

6. RAISING WITH NEW CONCRETE



(a) Abutment

$$\textcircled{1} = 0.74 \times 0.30 = 0.222$$

$$\textcircled{2} = 1.10 \times 1.43 = 1.573$$

$$\textcircled{3} = 0.50 \times 0.75 = 0.375$$

$$\textcircled{4} = \frac{0.35 \times 0.50}{2} = 0.0875$$

$$2.2575 \text{ m}^2$$

$$V_a = 2 \times 2.2575 \times 4.50 = 20.320 \text{ m}^3$$

(b) Wing Wall

$$V_w = 2 \times 2 \times \left( 2.5 \times 2.67 - \frac{1.17 \times 1.17}{2} \right) \times 0.3 = 7.18866 \text{ m}^3$$

$$\text{Total (a) + (b) = 27.51 m}^3$$

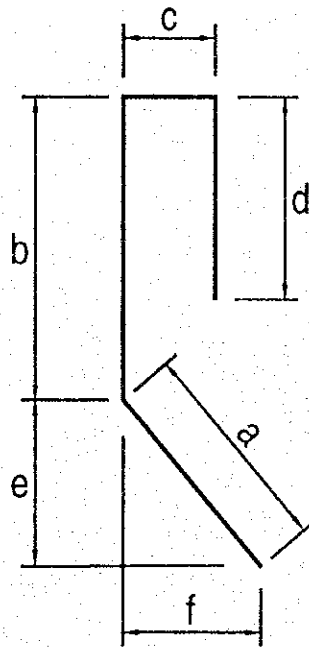


| Name of Structure | RAILWAY BRIDGE<br>BH.13 | Category of calculation | WORK VOLUME | Page |
|-------------------|-------------------------|-------------------------|-------------|------|
|-------------------|-------------------------|-------------------------|-------------|------|

7. REINFORCING BAR

A. ABUTMENT RAISING

1. N = 16 ; D = 22



a = 1435

b = 1250

c = 150

d = 1300

L (a+b+c+d) = 4135

e = 1175

f = 825

Weight = 16 x 4.135 x 2.98 = 197.157 kg

2. N = 14 ; D = 22

a = 1435

b = 1200

c = 150

d = 1200

L (a+b+c+d) = 3985

e = 1175

f = 825

Weight = 14 x 3.985 x 2.98 = 166.254 kg

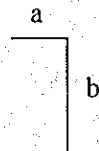
3. N = 16 ; D = 22

a = 850

b = 2030

L (a+b) = 2880

Weight = 16 x 2.88 x 2.98 = 137.308 kg



4. a = L = 2030, D = 22, N = 16

Weight = 16 x 2.03 x 2.98 = 96.790 kg

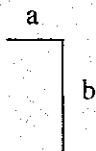
5. D = 22, N = 14

a = 850

b = 1880

L (a+b) = 2730

Weight = 14 x 2.73 x 2.98 = 113.896 kg



6. a = L = 1880, D = 22, N = 14

Weight = 14 x 1.88 x 2.98 = 78.434 kg

7. D = 13, N = 28

L = 4500 - 200 = 4300

| Name of Structure | RAILWAY BRIDGE<br>BH.13 | Category of calculation | WORK VOLUME | Page |  |
|-------------------|-------------------------|-------------------------|-------------|------|--|
|-------------------|-------------------------|-------------------------|-------------|------|--|

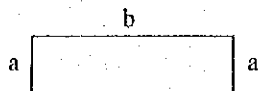
$$\text{Weight} = 28 \times 4.3 \times 1.04 = 125.216 \text{ kg}$$

8.  $N = 2 \times 2 = 4, D = 13$

$$a = 200$$

$$b = 1025$$

$$L = 1425$$



$$\text{Weight} = 4 \times 1.425 \times 1.04 = 5.928 \text{ kg}$$

9.  $D = 13, N = 2$

$$L = 2250 + 2 \times 150 = 2550$$

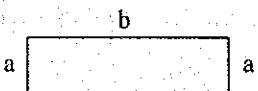
$$\text{Weight} = 2 \times 2.55 \times 1.04 = 5.304 \text{ kg}$$

10.  $N = 2 \times 5 = 10, D = 13$

$$a = 200$$

$$b = 1025$$

$$L = 1425$$



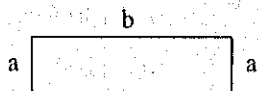
$$\text{Weight} = 10 \times 1.425 \times 1.04 = 14.82 \text{ kg}$$

11.  $N = 5, D = 13$

$$a = 200$$

$$b = 2550$$

$$L = 2950$$



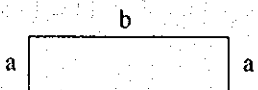
$$\text{Weight} = 5 \times 2.95 \times 1.04 = 15.34 \text{ kg}$$

12.  $N = 2 \times 2 \times 1025/300 = 13, D = 16$

$$a = 50$$

$$b = 600$$

$$L = 700$$



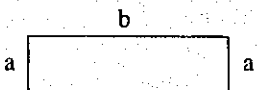
$$\text{Weight} = 13 \times 0.70 \times 1.58 = 14.378 \text{ kg}$$

13.  $N = 2 \times 1025/300 = 6, D = 16$

$$a = 50$$

$$b = 700$$

$$L = 800$$



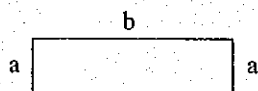
$$\text{Weight} = 6 \times 0.8 \times 1.58 = 7.584 \text{ kg}$$

14.  $N = 2 \times 1025/300 = 6, D = 16$

$$a = 50$$

$$b = 900$$

$$L = 1,000$$

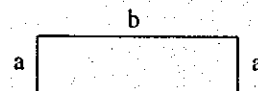


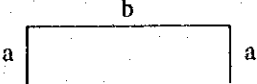
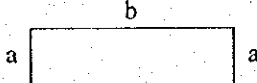
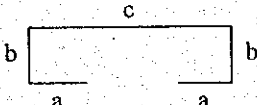
$$\text{Weight} = 6 \times 1.0 \times 1.58 = 9.48 \text{ kg}$$

15.  $N = 2 \times 2 \times 2250/300 = 30, D = 16$

$$a = 50$$

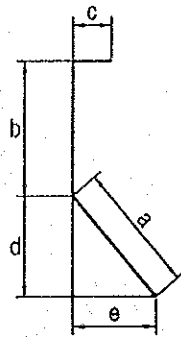
$$b = 600$$



| Name of Structure   | RAILWAY BRIDGE<br>BH.13 | Category of calculation | WORK VOLUME | Page |  |
|---|-------------------------|-------------------------|-------------|------|--|
| <p><math>L = 700</math><br/> <math>\text{Weight} = 30 \times 0.70 \times 1.58 = 33.18 \text{ kg}</math></p> <p>16. <math>N = 2250/300 = 7, D = 16</math><br/> <math>a = 50</math><br/> <math>b = 700</math></p>  <p><math>L = 750</math><br/> <math>\text{Weight} = 7 \times 0.75 \times 1.58 = 8.295 \text{ kg}</math></p> <p>17. <math>N = 2250/300 = 7, D = 16</math><br/> <math>a = 50</math><br/> <math>b = 900</math></p>  <p><math>L = 950</math><br/> <math>\text{Weight} = 7 \times 0.95 \times 1.58 = 10.507 \text{ kg}</math></p> <p>18. <math>N = 2 \times 2 = 4, D = 22</math><br/> <math>L = 2080</math><br/> <math>\text{Weight} = 4 \times 2.08 \times 2.98 = 12.397 \text{ kg}</math></p> <p>Total 1 - 18 = 1052.268 kg</p>  |                         |                         |             |      |  |
| <p><b>B. WING WALL</b></p>  |                         |                         |             |      |  |
| <p>1. <math>N = 7 \times 2 \times 2 ; D = 13</math><br/> <math>L \text{ total} = 7 \times 1400 + (75 + 242 + 409 + 576 + 743 + 910 + 1077) = 13832</math><br/> <math>\text{Weight} = 2 \times 2 \times 13.832 \times 1.04 = 57.541 \text{ kg}</math></p> <p>2. <math>N = 5 \times 2 \times 2 = 20 ; D = 13</math><br/> <math>L = 2570</math><br/> <math>\text{Weight} = 20 \times 2.57 \times 1.04 = 53.456 \text{ kg}</math></p> <p>3. <math>N = 5 \times 2 \times 2 = 20 ; D = 22</math><br/> <math>L = 2300</math><br/> <math>\text{Weight} = 20 \times 2.3 \times 2.98 = 137.08 \text{ kg}</math></p> <p>4. <math>N = 5 \times 2 \times 2 = 20 ; D = 22</math><br/> <math>L = 3100</math><br/> <math>\text{Weight} = 20 \times 3.10 \times 2.98 = 184.76 \text{ kg}</math></p> <p>5. <math>N = 8 \times 2 \times 2 = 32 ; D = 22</math><br/> <math>L \text{ total} = 8 \times 1550 + (75 + 275 + 475 + 675 + 875 + 1075 + 1275 + 1475) = 18600</math><br/> <math>\text{Weight} = 2 \times 2 \times 18.600 \times 2.98 = 221.712 \text{ kg}</math></p> <p>6. <math>N = 8 \times 2 = 16, D = 13</math><br/> <math>a = 50</math><br/> <math>b = 100</math><br/> <math>c = 239</math></p>  <p><math>L = 539</math></p> |                         |                         |             |      |  |
| <p style="text-align: center;">7-40</p>   |                         |                         |             |      |  |

$$\text{Weight} = 16 \times 0.539 \times 1.04 = 8.969 \text{ kg}$$

7.



$$N = 2 \times 2 = 4 ; D = 13$$

$$a = 1975$$

$$b = 1375$$

$$c = 50$$

$$L(a+b+c) = 3400$$

$$d = 1225$$

$$e = 1550$$

$$\text{Weight} = 4 \times 3.4 \times 1.04 = 14.144 \text{ kg}$$

$$\text{Total 1 - 7} = 677.662 \text{ kg}$$

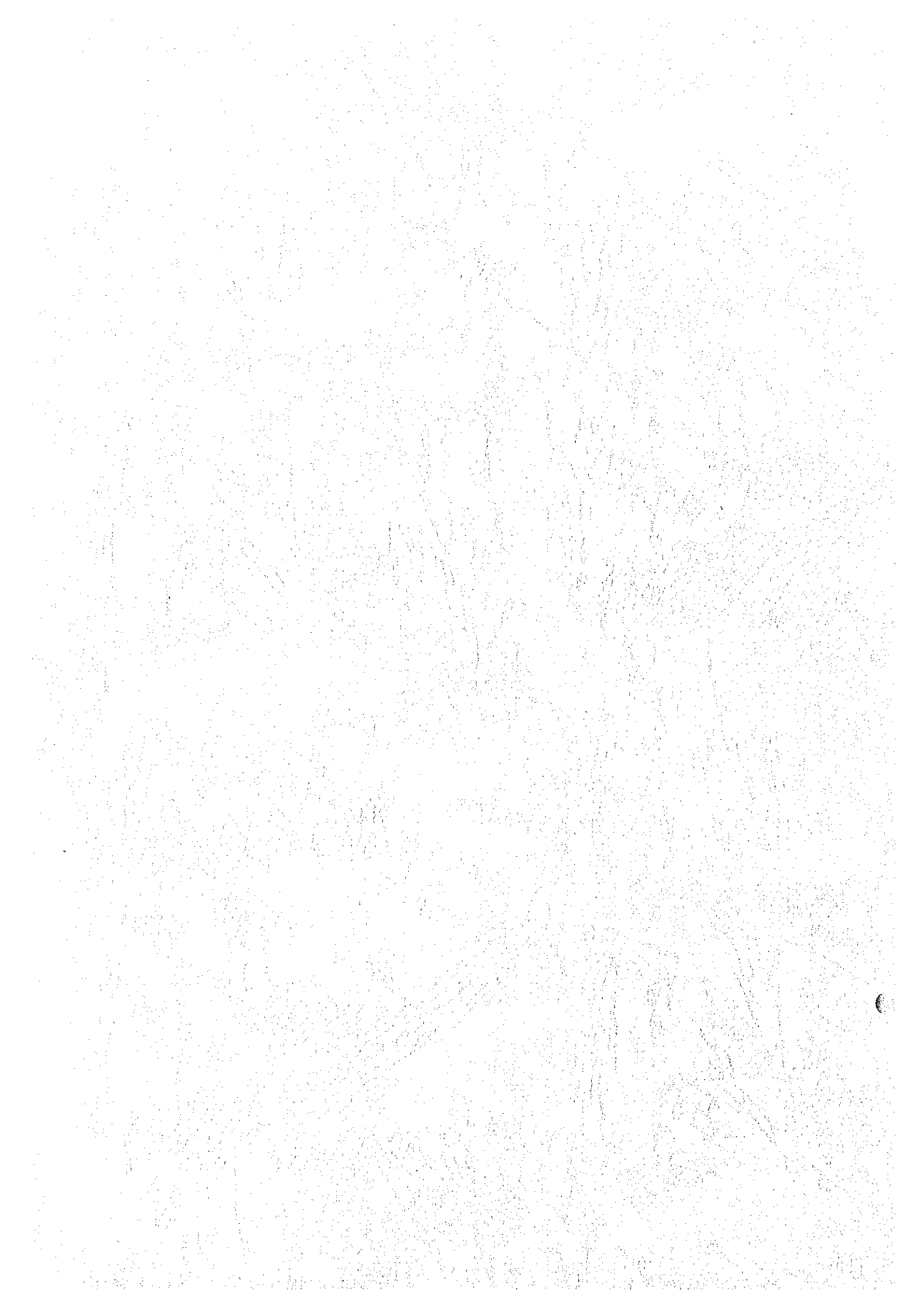
$$\text{Total of Reinforcing Bar} = 1729.93 \text{ kg}$$

$$\text{For Both Side} = 2 \times 1729.93 \text{ kg} = 3459.86 \text{ kg} \cong 3460 \text{ kg}$$

| Name of Structure | TEMPORARY SUPPORT FOR RAILWAY BRIDGE BH.13  | Category Calculation | WORK VOLUME            | Page |  |
|-------------------|---|----------------------|------------------------|------|--|
| <b>SUMMARY</b>    |   |                      |                        |      |  |
|                   | 1. COCONUT TREE PILES L = 5.50 m; Ø = 30 cm |                      | = 198 m <sup>3</sup>   |      |  |
|                   | 2. WOODEN                                   |                      | = 10.90 m <sup>3</sup> |      |  |
|                   | 3. STEEL BEAM H - 500 x 300 x 16            |                      | = 16,000 kg            |      |  |

| Name of Structure   | TEMPORARY SUPPORT FOR RAILWAY BRIDGE BH.13 | Category Calculation | WORK VOLUME | Page |  |
|---|--|----------------------|-------------|------|--|
| 1. COCONUT TREE PILE  |  |                      |             |      |  |
| L = 5.50 m; Ø = 30 cm   |  |                      |             |      |  |
| N = 4 x 9 = 36 nos.   |  |                      |             |      |  |
| Total Length = 36 x 5.50 = 198 m'                               |  |                      |             |      |  |
| 2. WOODEN   |  |                      |             |      |  |
| (a) Wooden Sleeper (2,000 x 200 x 130)                          |  |                      |             |      |  |
| N = 2 x (4 x 4 + 4 x 3) + 4 x (2 x 3 x 4) = 152 nos.            |  |                      |             |      |  |
| V = 2 x 0.2 x 0.13 x 152 = 7.90 m <sup>3</sup>                  |  |                      |             |      |  |
| (b) Wooden for Pile Cap (2,000 x 200 x 200)                     |  |                      |             |      |  |
| N = 3 x 4 = 12 nos.   |  |                      |             |      |  |
| V = 2 x 0.2 x 0.2 x 12 = 0.96 m <sup>3</sup>                    |  |                      |             |      |  |
| (c) Wooden for Ballast Stopper (2,250 x 200 x 130)              |  |                      |             |      |  |
| N = 2 x (3.0 / 0.2) = 30 nos.                                   |  |                      |             |      |  |
| V = 2.25 x 0.2 x 0.13 x 30 = 1.76 m <sup>3</sup>                |  |                      |             |      |  |
| (d) Wooden Pile Stability                                       |  |                      |             |      |  |
| - For (2,000 x 200 x 130)                                       |  |                      |             |      |  |
| N = 4 x 4 x 2 = 32 nos.   |  |                      |             |      |  |
| V = 1.65 x 0.07 x 0.05 x 32 = 0.18 m <sup>3</sup>               |  |                      |             |      |  |
| - For (1,750 x 70 x 50)   |  |                      |             |      |  |
| N = 4 x 4 x 1 = 16 nos.   |  |                      |             |      |  |
| V = 1.75 x 0.07 x 0.05 x 16 = 0.10 m <sup>3</sup>               |  |                      |             |      |  |
| Sub Total V = 0.18 + 0.10 = 0.28 m <sup>3</sup>                 |  |                      |             |      |  |
| Total Wooden = 7.90 + 0.96 + 1.76 + 0.28 = 10.90 m <sup>3</sup> |  |                      |             |      |  |
| 3. STEEL H - BEAM   |  |                      |             |      |  |
| L = 10,000; H - 500 x 300 x 16; Weight = 200 kg/m               |  |                      |             |      |  |
| N = 2 x 4 = 8 nos.  |  |                      |             |      |  |
| Weight = 10 x 8 x 200 = 16,000 kg                               |  |                      |             |      |  |









JICA