

|                                                                                   |                                                                                                                                                                                                                                                              |                                                                                                                                |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
|  | <p align="center">INFORME DE ENSAYO</p> <p align="center"><b>PESO UNITARIO EN MUESTRAS IRREGULARES</b></p> <p align="center"><b>(MÉTODO PARAFINADO)</b></p> <p align="center"><b>METODO ISRM-07</b></p> <p align="center">Referencia SYP-PT-DT-1089-5/14</p> |  <p>ISO / IEC 17025:2005<br/>10-LAB-040</p> |
|                                                                                   |                                                                                                                                                                                                                                                              |                                                                                                                                |

|                     |                                            |                              |            |
|---------------------|--------------------------------------------|------------------------------|------------|
| <b>PROYECTO:</b>    | CYDG-827 GEB AVR MOCOA                     | <b>FECHA DE ENSAYO:</b>      | 2018-02-24 |
| <b>CLIENTE:</b>     | INGENIERÍA, CONSTRUCCIONES Y DISEÑO S.A.S. | <b>ORDEN DE TRABAJO No.</b>  | 8100       |
| <b>DIR CLIENTE:</b> | CALLE 53 A No. 16 - 36 BOGOTÁ              | <b>INFORME DE ENSAYO No.</b> | 8100-215   |
| <b>CÓDIGO:</b>      | 2343                                       |                              |            |

|                 |                   |                   |                 |
|-----------------|-------------------|-------------------|-----------------|
| <b>EQUIPOS:</b> | Calibrador No: 06 | Balanza No: 16-01 | Horno No: HN-01 |
|-----------------|-------------------|-------------------|-----------------|

|                                                                       |            |                 |          |                         |                    |
|-----------------------------------------------------------------------|------------|-----------------|----------|-------------------------|--------------------|
| <b>SONDEO:</b>                                                        | <b>P14</b> | <b>MUESTRA:</b> | <b>3</b> | <b>PROFUNDIDAD(m) :</b> | <b>1,50 - 2,00</b> |
| <b>DESCRIPCIÓN:</b> Arena gravo limosa, de color grisáceo amarillento |            |                 |          |                         |                    |
| <b>OBSERVACIONES:</b> -                                               |            |                 |          |                         |                    |

| <table border="1"> <tr><th align="center" colspan="2">Wn</th></tr> <tr><td>Recipiente</td><td>B-080</td></tr> <tr><td>P<sub>1</sub> (g)</td><td>210,40</td></tr> <tr><td>P<sub>2</sub> (g)</td><td>166,80</td></tr> <tr><td>P<sub>3</sub> (g)</td><td>38,95</td></tr> <tr><td>Humedad</td><td><b>34,1%</b></td></tr> </table> |              |                                                       | Wn |                                      | Recipiente | B-080 | P <sub>1</sub> (g) | 210,40 | P <sub>2</sub> (g) | 166,80 | P <sub>3</sub> (g) | 38,95 | Humedad | <b>34,1%</b> | <table border="1"> <tr><th align="center" colspan="2">PESO UNITARIO</th></tr> <tr><td>W1</td><td>223,0</td></tr> <tr><td>W2</td><td>232,0</td></tr> <tr><td>W3</td><td>102,8</td></tr> <tr><td>gt (g/cm³)</td><td><b>1,871</b></td></tr> <tr><td>gd (g/cm³)</td><td><b>1,395</b></td></tr> </table> |  |  | PESO UNITARIO |  | W1 | 223,0 | W2 | 232,0 | W3 | 102,8 | gt (g/cm³) | <b>1,871</b> | gd (g/cm³) | <b>1,395</b> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-------------------------------------------------------|----|--------------------------------------|------------|-------|--------------------|--------|--------------------|--------|--------------------|-------|---------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|---------------|--|----|-------|----|-------|----|-------|------------|--------------|------------|--------------|
| Wn                                                                                                                                                                                                                                                                                                                            |              |                                                       |    |                                      |            |       |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                     |  |  |               |  |    |       |    |       |    |       |            |              |            |              |
| Recipiente                                                                                                                                                                                                                                                                                                                    | B-080        |                                                       |    |                                      |            |       |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                     |  |  |               |  |    |       |    |       |    |       |            |              |            |              |
| P <sub>1</sub> (g)                                                                                                                                                                                                                                                                                                            | 210,40       |                                                       |    |                                      |            |       |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                     |  |  |               |  |    |       |    |       |    |       |            |              |            |              |
| P <sub>2</sub> (g)                                                                                                                                                                                                                                                                                                            | 166,80       |                                                       |    |                                      |            |       |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                     |  |  |               |  |    |       |    |       |    |       |            |              |            |              |
| P <sub>3</sub> (g)                                                                                                                                                                                                                                                                                                            | 38,95        |                                                       |    |                                      |            |       |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                     |  |  |               |  |    |       |    |       |    |       |            |              |            |              |
| Humedad                                                                                                                                                                                                                                                                                                                       | <b>34,1%</b> |                                                       |    |                                      |            |       |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                     |  |  |               |  |    |       |    |       |    |       |            |              |            |              |
| PESO UNITARIO                                                                                                                                                                                                                                                                                                                 |              |                                                       |    |                                      |            |       |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                     |  |  |               |  |    |       |    |       |    |       |            |              |            |              |
| W1                                                                                                                                                                                                                                                                                                                            | 223,0        |                                                       |    |                                      |            |       |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                     |  |  |               |  |    |       |    |       |    |       |            |              |            |              |
| W2                                                                                                                                                                                                                                                                                                                            | 232,0        |                                                       |    |                                      |            |       |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                     |  |  |               |  |    |       |    |       |    |       |            |              |            |              |
| W3                                                                                                                                                                                                                                                                                                                            | 102,8        |                                                       |    |                                      |            |       |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                     |  |  |               |  |    |       |    |       |    |       |            |              |            |              |
| gt (g/cm³)                                                                                                                                                                                                                                                                                                                    | <b>1,871</b> |                                                       |    |                                      |            |       |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                     |  |  |               |  |    |       |    |       |    |       |            |              |            |              |
| gd (g/cm³)                                                                                                                                                                                                                                                                                                                    | <b>1,395</b> |                                                       |    |                                      |            |       |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                     |  |  |               |  |    |       |    |       |    |       |            |              |            |              |
| P <sub>1</sub> = Peso del recipiente mas muestra húmeda                                                                                                                                                                                                                                                                       |              | P <sub>2</sub> = Peso del recipiente mas muestra seca |    | P <sub>3</sub> = Peso del recipiente |            |       |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                     |  |  |               |  |    |       |    |       |    |       |            |              |            |              |
| W1= Masa de la muestra humeda                                                                                                                                                                                                                                                                                                 |              | W2= Masa de la muestra parafinada                     |    | W3= Masa parafinada sumergida        |            |       |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                     |  |  |               |  |    |       |    |       |    |       |            |              |            |              |

|                                                                              |            |                 |          |                         |                    |
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| <b>SONDEO:</b>                                                               | <b>P14</b> | <b>MUESTRA:</b> | <b>6</b> | <b>PROFUNDIDAD(m) :</b> | <b>3,00 - 3,50</b> |
| <b>DESCRIPCIÓN:</b> Limo arenoso, de color grisáceo verdoso, con oxidaciones |            |                 |          |                         |                    |
| <b>OBSERVACIONES:</b> -                                                      |            |                 |          |                         |                    |

| <table border="1"> <tr><th align="center" colspan="2">Wn</th></tr> <tr><td>Recipiente</td><td>B-3</td></tr> <tr><td>P<sub>1</sub> (g)</td><td>283,30</td></tr> <tr><td>P<sub>2</sub> (g)</td><td>225,77</td></tr> <tr><td>P<sub>3</sub> (g)</td><td>33,88</td></tr> <tr><td>Humedad</td><td><b>30,0%</b></td></tr> </table> |              |                                                       | Wn |                                      | Recipiente | B-3 | P <sub>1</sub> (g) | 283,30 | P <sub>2</sub> (g) | 225,77 | P <sub>3</sub> (g) | 33,88 | Humedad | <b>30,0%</b> | <table border="1"> <tr><th align="center" colspan="2">PESO UNITARIO</th></tr> <tr><td>W1</td><td>139,1</td></tr> <tr><td>W2</td><td>145,3</td></tr> <tr><td>W3</td><td>67,6</td></tr> <tr><td>gt (g/cm³)</td><td><b>1,964</b></td></tr> <tr><td>gd (g/cm³)</td><td><b>1,511</b></td></tr> </table> |  |  | PESO UNITARIO |  | W1 | 139,1 | W2 | 145,3 | W3 | 67,6 | gt (g/cm³) | <b>1,964</b> | gd (g/cm³) | <b>1,511</b> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-------------------------------------------------------|----|--------------------------------------|------------|-----|--------------------|--------|--------------------|--------|--------------------|-------|---------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|---------------|--|----|-------|----|-------|----|------|------------|--------------|------------|--------------|
| Wn                                                                                                                                                                                                                                                                                                                          |              |                                                       |    |                                      |            |     |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                    |  |  |               |  |    |       |    |       |    |      |            |              |            |              |
| Recipiente                                                                                                                                                                                                                                                                                                                  | B-3          |                                                       |    |                                      |            |     |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                    |  |  |               |  |    |       |    |       |    |      |            |              |            |              |
| P <sub>1</sub> (g)                                                                                                                                                                                                                                                                                                          | 283,30       |                                                       |    |                                      |            |     |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                    |  |  |               |  |    |       |    |       |    |      |            |              |            |              |
| P <sub>2</sub> (g)                                                                                                                                                                                                                                                                                                          | 225,77       |                                                       |    |                                      |            |     |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                    |  |  |               |  |    |       |    |       |    |      |            |              |            |              |
| P <sub>3</sub> (g)                                                                                                                                                                                                                                                                                                          | 33,88        |                                                       |    |                                      |            |     |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                    |  |  |               |  |    |       |    |       |    |      |            |              |            |              |
| Humedad                                                                                                                                                                                                                                                                                                                     | <b>30,0%</b> |                                                       |    |                                      |            |     |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                    |  |  |               |  |    |       |    |       |    |      |            |              |            |              |
| PESO UNITARIO                                                                                                                                                                                                                                                                                                               |              |                                                       |    |                                      |            |     |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                    |  |  |               |  |    |       |    |       |    |      |            |              |            |              |
| W1                                                                                                                                                                                                                                                                                                                          | 139,1        |                                                       |    |                                      |            |     |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                    |  |  |               |  |    |       |    |       |    |      |            |              |            |              |
| W2                                                                                                                                                                                                                                                                                                                          | 145,3        |                                                       |    |                                      |            |     |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                    |  |  |               |  |    |       |    |       |    |      |            |              |            |              |
| W3                                                                                                                                                                                                                                                                                                                          | 67,6         |                                                       |    |                                      |            |     |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                    |  |  |               |  |    |       |    |       |    |      |            |              |            |              |
| gt (g/cm³)                                                                                                                                                                                                                                                                                                                  | <b>1,964</b> |                                                       |    |                                      |            |     |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                    |  |  |               |  |    |       |    |       |    |      |            |              |            |              |
| gd (g/cm³)                                                                                                                                                                                                                                                                                                                  | <b>1,511</b> |                                                       |    |                                      |            |     |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                    |  |  |               |  |    |       |    |       |    |      |            |              |            |              |
| P <sub>1</sub> = Peso del recipiente mas muestra húmeda                                                                                                                                                                                                                                                                     |              | P <sub>2</sub> = Peso del recipiente mas muestra seca |    | P <sub>3</sub> = Peso del recipiente |            |     |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                    |  |  |               |  |    |       |    |       |    |      |            |              |            |              |
| W1= Masa de la muestra humeda                                                                                                                                                                                                                                                                                               |              | W2= Masa de la muestra parafinada                     |    | W3= Masa parafinada sumergida        |            |     |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                    |  |  |               |  |    |       |    |       |    |      |            |              |            |              |

|                                                                            |            |                 |          |                         |                    |
|----------------------------------------------------------------------------|------------|-----------------|----------|-------------------------|--------------------|
| <b>SONDEO:</b>                                                             | <b>P14</b> | <b>MUESTRA:</b> | <b>7</b> | <b>PROFUNDIDAD(m) :</b> | <b>3,50 - 4,00</b> |
| <b>DESCRIPCIÓN:</b> Limo arenoso, de color grisáceo claro, con oxidaciones |            |                 |          |                         |                    |
| <b>OBSERVACIONES:</b> -                                                    |            |                 |          |                         |                    |

| <table border="1"> <tr><th align="center" colspan="2">Wn</th></tr> <tr><td>Recipiente</td><td>122</td></tr> <tr><td>P<sub>1</sub> (g)</td><td>245,10</td></tr> <tr><td>P<sub>2</sub> (g)</td><td>205,69</td></tr> <tr><td>P<sub>3</sub> (g)</td><td>19,30</td></tr> <tr><td>Humedad</td><td><b>21,1%</b></td></tr> </table> |              |                                           | Wn |                               | Recipiente | 122 | P <sub>1</sub> (g) | 245,10 | P <sub>2</sub> (g) | 205,69 | P <sub>3</sub> (g) | 19,30 | Humedad | <b>21,1%</b> | <table border="1"> <tr><th align="center" colspan="2">PESO UNITARIO</th></tr> <tr><td>W1</td><td>245,0</td></tr> <tr><td>W2</td><td>257,0</td></tr> <tr><td>W3</td><td>110,5</td></tr> <tr><td>gt (g/cm³)</td><td><b>1,840</b></td></tr> <tr><td>gd (g/cm³)</td><td><b>1,519</b></td></tr> </table> |  |  | PESO UNITARIO |  | W1 | 245,0 | W2 | 257,0 | W3 | 110,5 | gt (g/cm³) | <b>1,840</b> | gd (g/cm³) | <b>1,519</b> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-------------------------------------------|----|-------------------------------|------------|-----|--------------------|--------|--------------------|--------|--------------------|-------|---------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|---------------|--|----|-------|----|-------|----|-------|------------|--------------|------------|--------------|
| Wn                                                                                                                                                                                                                                                                                                                          |              |                                           |    |                               |            |     |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                     |  |  |               |  |    |       |    |       |    |       |            |              |            |              |
| Recipiente                                                                                                                                                                                                                                                                                                                  | 122          |                                           |    |                               |            |     |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                     |  |  |               |  |    |       |    |       |    |       |            |              |            |              |
| P <sub>1</sub> (g)                                                                                                                                                                                                                                                                                                          | 245,10       |                                           |    |                               |            |     |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                     |  |  |               |  |    |       |    |       |    |       |            |              |            |              |
| P <sub>2</sub> (g)                                                                                                                                                                                                                                                                                                          | 205,69       |                                           |    |                               |            |     |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                     |  |  |               |  |    |       |    |       |    |       |            |              |            |              |
| P <sub>3</sub> (g)                                                                                                                                                                                                                                                                                                          | 19,30        |                                           |    |                               |            |     |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                     |  |  |               |  |    |       |    |       |    |       |            |              |            |              |
| Humedad                                                                                                                                                                                                                                                                                                                     | <b>21,1%</b> |                                           |    |                               |            |     |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                     |  |  |               |  |    |       |    |       |    |       |            |              |            |              |
| PESO UNITARIO                                                                                                                                                                                                                                                                                                               |              |                                           |    |                               |            |     |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                     |  |  |               |  |    |       |    |       |    |       |            |              |            |              |
| W1                                                                                                                                                                                                                                                                                                                          | 245,0        |                                           |    |                               |            |     |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                     |  |  |               |  |    |       |    |       |    |       |            |              |            |              |
| W2                                                                                                                                                                                                                                                                                                                          | 257,0        |                                           |    |                               |            |     |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                     |  |  |               |  |    |       |    |       |    |       |            |              |            |              |
| W3                                                                                                                                                                                                                                                                                                                          | 110,5        |                                           |    |                               |            |     |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                     |  |  |               |  |    |       |    |       |    |       |            |              |            |              |
| gt (g/cm³)                                                                                                                                                                                                                                                                                                                  | <b>1,840</b> |                                           |    |                               |            |     |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                     |  |  |               |  |    |       |    |       |    |       |            |              |            |              |
| gd (g/cm³)                                                                                                                                                                                                                                                                                                                  | <b>1,519</b> |                                           |    |                               |            |     |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                     |  |  |               |  |    |       |    |       |    |       |            |              |            |              |
| P1 = Masa del recipiente mas muestra húmeda                                                                                                                                                                                                                                                                                 |              | P2 = Masa del recipiente mas muestra seca |    | P3 = Masa del recipiente      |            |     |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                     |  |  |               |  |    |       |    |       |    |       |            |              |            |              |
| W1= Masa de la muestra humeda                                                                                                                                                                                                                                                                                               |              | W2= Masa de la muestra parafinada         |    | W3= Masa parafinada sumergida |            |     |                    |        |                    |        |                    |       |         |              |                                                                                                                                                                                                                                                                                                     |  |  |               |  |    |       |    |       |    |       |            |              |            |              |

HCF

REVISÓ Y APROBÓ

GREGORIO ROJAS ROJAS

DIRECTOR TÉCNICO

LOS RESULTADOS PRESENTADOS CORRESPONDEN ÚNICAMENTE A LA MUESTRA SOMETIDA A ENSAYO. ESTE INFORME NO PUEDE SER REPRODUCIDO EN SU TOTALIDAD NI PARCIALMENTE, SIN LA AUTORIZACIÓN ESCRITA DEL LABORATORIO QUE LO EMITE. ESTE INFORME NO ES VÁLIDO SIN LA FIRMA ORIGINAL DE QUIEN REVISÓ Y APROBÓ, Y EL SELLO.

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