BNL-101861-2014-TECH
AD/RHIC/RD/78;BNL-101861-2013-IR

# Calculated Volume for the RHIC Magnet Enclosure

D. P. Brown

November 1994

Collider Accelerator Department
**Brookhaven National Laboratory**

**U.S. Department of Energy**
USDOE Office of Science (SC)

# DISCLAIMER

AD/RHIC/RD–78

**RHIC PROJECT**

Brookhaven National Laboratory

# Calculated Volume for the RHIC Magnet Enclosure

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# CALCULATED VOLUME FOR THE RHIC MAGNET ENCLOSURE

D. P. Brown

The study of the Oxygen Deficiency Hazard conditions in the RHIC Magnet Enclosure (RME) or Tunnel required that the volume of each sextant of the RME be calculated. The standard tunnel section is 16-feet in diameter and has its bottom truncated so that the floor-to-ceiling height is 11-feet. A series of elevation drawings of the RME, one per sextant, were prepared. See attached Drawings 01055057, 01055058, 01055061, 01055064, 01055065 and 01055066. These drawings show the various enlargements or "bumps" in the standard tunnel. None of the experimental area buildings are included in these volume calculations.

The information from these drawings was distilled down into a spreadsheet which calculates the volume of the tunnel. The dimensions of the "bumps" are listed in each table (Figures 1 through 6). The results of a calculation for the total tunnel volume of each sextant are shown in Figure 1. The areas of the segments and sectors of a circle are based on the standard formulas.[1] The cross-sectional area of the standard 16-foot tunnel is 147 square feet. An allowance or "deduct" was made in the volume calculation based on an estimated total of 10 square feet cross-sectional area for the magnets and other equipment in the tunnel. The line for "Total Arc Length" gives the arc length from the wall of one experimental area to the wall of its neighboring hall. At 8:00, only the main hall , not the smaller approach halls, is excluded from the tunnel volume. The injection tunnels will be separated by a partition from the main RHIC tunnel and, therefore, are not included in this calculation.

This spreadsheet can be used to calculate partial volumes for the tunnel. A "deduct" for the volume of equipment in the tunnel, linearly scaled with height, was made for each partial volume calculated. Three partial volumes are given in Figures 2, 3 and 4. Figure 2 calculates the volume of the "attics" of the tunnel, i.e., anything higher than the standard tunnel height, 11-feet above floor level. Although it is not shown in the bump dimension columns, added to the volume of the A and C alcoves is the calculated volume of the 7 x 7 x 6.5 foot extension above the main attic. Figure 3 calculates the volume of anything higher than 6.5 feet above the floor. This particular height is chosen because it results in a tunnel volume above it equal to 170,000 standard cubic feet in Sextant 5. 170,000 SCF is the volume of helium in the magnet circuit in one ring sextant which could, in the case of an uncontrolled release, displace air in the tunnel if the exhaust fans failed to operate. Figure 4 shows the calculation for the volume of anything eight feet above the floor. This is another volume (related to the height of the Sextant 5 exit tunnel to Building 1005) used in the safety analysis. Figures 5 and 6 show that for the sextants with the smallest volume (fewer and smaller "bumps") a release of 170,000 cubic feet would displace air down to about 4 feet above the floor if the exhaust fans failed to operate.

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[1] "Handbook of Mathematical Tables and Formulas," R. S. Burington, 3rd Edition, 1949

# SEXTANT VOLUMES

Linear dimensions are in feet, volumes in cubic feet

| Type | Length | Width | Height | Volume | Sextant Number 1 | 3 | 5 | 7 | 9 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|
| Calculation of Volume above | | | 0.0 | feet from floor including Attics (for 0<height<11) | | | | | | |
| R = | 8.00 | | | R = radius of circle | | | | | | |
| h = | 11.00 | | | h = sagitta of arc | | | | | | |
| d = | -3.00 | | | d = center to chord = R-h | | | | | | |
| T = | 3.910 | rad | | T = included angle of sector = 2*acos(d/R) | | | | | | |
| = | 224.05 | deg | | | | | | | | |
| l = | 14.83 | | | l = chord length across sector = 2*R*sin(T/2) | | | | | | |
| Acir = | 201.06 | | | Acir = area of circle = Pi*R**2 | | | | | | |
| Asec = | 125.13 | | | Asec = area of whole sector = .5*T*R**2 | | | | | | |
| Aseg = | 147.38 | | | Aseg = area of segment outside of chord = 0.5*(T-sin(T) | | | | | | |
| | Total Arc Length = | | | | 2046 | 1934 | 1976 | 2039 | 1918 | 1921 |
| | Bump Volumes: | | | | | | | | | |
| 1 | 97 | 20 | 14 | 27160 | | | 27160 | | | |
| 2 | 7 | 20 | 19 | 2660 | 2660 | 2660 | 2660 | 2660 | 2660 | 2660 |
| 3 | 78 | 23 | 12 | 21528 | | | 21528 | | | |
| A | 15 | 42 | 12 | 8111 | 8111 | 8111 | 8111 | 8111 | 8111 | 8111 |
| B | 22 | 42 | 19 | 16850 | 16850 | 16850 | 16850 | 16850 | 16850 | 16850 |
| C | 15 | 42 | 12 | 8111 | 8111 | 8111 | 8111 | 8111 | 8111 | 8111 |
| 4 | 465 | 20 | 14 | 137320 | | | 137320 | | | |
| 5 | 436 | 20 | 14 | 129080 | | | | 129080 | | |
| 6 | 161 | 20 | 16 | 51360 | | | | 51360 | 51360 | |
| 2a | 7 | 20 | 19 | 2660 | 2660 | | | | 2660 | 2660 |
| | 16-ft Tunnel Volumes: | | | | | | | | | |
| 16' | 1980 | 147 | * | 291749 | 291749 | | | | | |
| 16' | 1875 | 147 | * | 276348 | | 276348 | | | | |
| 16' | 1276 | 147 | * | 188077 | | | 188077 | | | |
| 16' | 1384 | 147 | * | 203910 | | | | 203910 | | |
| 16' | 1692 | 147 | * | 249303 | | | | | 249303 | |
| 16' | 1855 | 147 | * | 273400 | | | | | | 273400 |
| Subtotal | | | | | 330141 | 312080 | 409817 | 420082 | 339055 | 311792 |
| Deduct for Equipment** | | | | | 20459 | 19344 | 19759 | 20394 | 19184 | 19214 |
| Total | | | | | 309682 | 292736 | 390058 | 399688 | 319871 | 292578 |

Total 16-ft Tunnel Cross-Sectional Area = 147 sq. ft.

* Value shown in Width column is area (sq ft) of a segment (Aseg, as calculated above) in the tunnel above the given height.

**Scaled value, linear with height

## SEXTANT VOLUMES

Linear dimensions are in feet, volumes in cubic feet

| Type | Length | Width | Height | Volume | Sextant Number 1 | 3 | 5 | 7 | 9 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|
| Calculation of Volume above | | | 11.0 | feet from floor including Attics (for 0<height<11) | | | | | | |
| R = | 8.00 | | | R = radius of circle | | | | | | |
| h = | 0.00 | | | h = sagitta of arc | | | | | | |
| d = | 8.00 | | | d = center to chord = R-h | | | | | | |
| T = | 0.000 | rad | | T = included angle of sector = 2*acos(d/R) | | | | | | |
| = | 0.00 | deg | | | | | | | | |
| l = | 0.00 | | | l = chord length across sector = 2*R*sin(T/2) | | | | | | |
| Acir = | 201.06 | | | Acir = area of circle = Pi*R**2 | | | | | | |
| Asec = | 0.00 | | | Asec = area of whole sector = .5*T*R**2 | | | | | | |
| Aseg = | 0.00 | | | Aseg = area of segment outside of chord = 0.5*(T-sin(T) | | | | | | |
| | Total Arc Length = | | | | 2046 | 1934 | 1976 | 2039 | 1918 | 1921 |
| | Bump Volumes: | | | | | | | | | |
| 1 | 97 | 20 | 3 | 5820 | | | 5820 | | | |
| 2 | 7 | 20 | 8 | 1120 | 1120 | 1120 | 1120 | 1120 | 1120 | 1120 |
| 3 | 78 | 23 | 1 | 1794 | | | 1794 | | | |
| A | 15 | 42 | 1 | 968 | 968 | 968 | 968 | 968 | 968 | 968 |
| B | 22 | 42 | 8 | 6831 | 6831 | 6831 | 6831 | 6831 | 6831 | 6831 |
| C | 15 | 42 | 1 | 968 | 968 | 968 | 968 | 968 | 968 | 968 |
| 4 | 465 | 20 | 3 | 29426 | | | 29426 | | | |
| 5 | 436 | 20 | 3 | 27660 | | | | 27660 | | |
| 6 | 161 | 20 | 5 | 16050 | | | | 16050 | 16050 | |
| 2a | 7 | 20 | 8 | 1120 | 1120 | | | | 1120 | 1120 |
| | 16-ft Tunnel Volumes: | | | | | | | | | |
| 16' | 1980 | 0 | * | 0 | 0 | | | | | |
| 16' | 1875 | 0 | * | 0 | | 0 | | | | |
| 16' | 1276 | 0 | * | 0 | | | 0 | | | |
| 16' | 1384 | 0 | * | 0 | | | | 0 | | |
| 16' | 1692 | 0 | * | 0 | | | | | 0 | |
| 16' | 1855 | 0 | * | 0 | | | | | | 0 |
| Subtotal | | | | | 11007 | 9887 | 46926 | 53597 | 27057 | 11007 |
| Deduct for Equipment** | | | | | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | | | | | 11007 | 9887 | 46926 | 53597 | 27057 | 11007 |

Total 16-ft Tunnel Cross-Sectional Area = 147 sq. ft.

* Value shown in Width column is area (sq ft) of a segment (Aseg, as calculated above) in the tunnel above the given height.

**Scaled value, linear with height

## SEXTANT VOLUMES

Linear dimensions are in feet, volumes in cubic feet

| Type | Length | Width | Height | Volume | Sextant Number 1 | 3 | 5 | 7 | 9 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|
| Calculation of Volume above | | | 6.5 | feet from floor including Attics (for 0<height<11) | | | | | | |
| R = | 8.00 | | | R = radius of circle | | | | | | |
| h = | 4.51 | | | h = sagitta of arc | | | | | | |
| d = | 3.49 | | | d = center to chord = R-h | | | | | | |
| T = | 2.240 | rad | | T = included angle of sector = 2*acos(d/R) | | | | | | |
| = | 128.34 | deg | | | | | | | | |
| l = | 14.40 | | | l = chord length across sector = 2*R*sin(T/2) | | | | | | |
| Acir = | 201.06 | | | Acir = area of circle = Pi*R**2 | | | | | | |
| Asec = | 71.68 | | | Asec = area of whole sector = .5*T*R**2 | | | | | | |
| Aseg = | 46.58 | | | Aseg = area of segment outside of chord = 0.5*(T-sin(T) | | | | | | |
| | Total Arc Length = | | | | 2046 | 1934 | 1976 | 2039 | 1918 | 1921 |
| | Bump Volumes: | | | | | | | | | |
| 1 | 97 | 20 | 8 | 14578 | | | 14578 | | | |
| 2 | 7 | 20 | 13 | 1752 | 1752 | 1752 | 1752 | 1752 | 1752 | 1752 |
| 3 | 78 | 23 | 6 | 9893 | | | 9893 | | | |
| A | 15 | 42 | 6 | 3899 | 3899 | 3899 | 3899 | 3899 | 3899 | 3899 |
| B | 22 | 42 | 12 | 10943 | 10943 | 10943 | 10943 | 10943 | 10943 | 10943 |
| C | 15 | 42 | 6 | 3899 | 3899 | 3899 | 3899 | 3899 | 3899 | 3899 |
| 4 | 465 | 20 | 8 | 73705 | | | 73705 | | | |
| 5 | 436 | 20 | 8 | 69282 | | | | 69282 | | |
| 6 | 161 | 20 | 10 | 30541 | | | | 30541 | 30541 | |
| 2a | 7 | 20 | 13 | 1752 | 1752 | | | | 1752 | 1752 |
| | 16-ft Tunnel Volumes: | | | | | | | | | |
| 16' | 1980 | 47 | * | 92205 | 92205 | | | | | |
| 16' | 1875 | 47 | * | 87338 | | 87338 | | | | |
| 16' | 1276 | 47 | * | 59440 | | | 59440 | | | |
| 16' | 1384 | 47 | * | 64444 | | | | 64444 | | |
| 16' | 1692 | 47 | * | 78790 | | | | | 78790 | |
| 16' | 1855 | 47 | * | 86406 | | | | | | 86406 |
| Subtotal | | | | | 114450 | 107831 | 178109 | 184760 | 131577 | 108651 |
| Deduct for Equipment** | | | | | 8396 | 7939 | 8109 | 8369 | 7873 | 7885 |
| Total | | | | | 106054 | 99892 | 170000 | 176391 | 123704 | 100766 |

Total 16-ft Tunnel Cross-Sectional Area = 147 sq. ft.

* Value shown in Width column is area (sq ft) of a segment (Aseg, as calculated above) in the tunnel above the given height.

**Scaled value, linear with height

# SEXTANT VOLUMES

Linear dimensions are in feet, volumes in cubic feet

| Type | Length | Width | Height | Volume | Sextant Number 1 | 3 | 5 | 7 | 9 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|
| Calculation of Volume above | | | 8.0 | feet from floor including Attics (for 0<height<11) | | | | | | |
| R = | 8.00 | | | R = radius of circle | | | | | | |
| h = | 3.00 | | | h = sagitta of arc | | | | | | |
| d = | 5.00 | | | d = center to chord = R-h | | | | | | |
| T = | 1.791 | rad | | T = included angle of sector = 2*acos(d/R) | | | | | | |
| = | 102.64 | deg | | | | | | | | |
| l = | 12.49 | | | l = chord length across sector = 2*R*sin(T/2) | | | | | | |
| Acir = | 201.06 | | | Acir = area of circle = Pi*R**2 | | | | | | |
| Asec = | 57.32 | | | Asec = area of whole sector = .5*T*R**2 | | | | | | |
| Aseg = | 26.10 | | | Aseg = area of segment outside of chord = 0.5*(T-sin(T) | | | | | | |
| | Total Arc Length = | | | | 2046 | 1934 | 1976 | 2039 | 1918 | 1921 |
| | Bump Volumes: | | | | | | | | | |
| 1 | 97 | 20 | 6 | 11640 | | | 11640 | | | |
| 2 | 7 | 20 | 11 | 1540 | 1540 | 1540 | 1540 | 1540 | 1540 | 1540 |
| 3 | 78 | 23 | 4 | 7176 | | | 7176 | | | |
| A | 15 | 42 | 4 | 2916 | 2916 | 2916 | 2916 | 2916 | 2916 | 2916 |
| B | 22 | 42 | 11 | 9563 | 9563 | 9563 | 9563 | 9563 | 9563 | 9563 |
| C | 15 | 42 | 4 | 2916 | 2916 | 2916 | 2916 | 2916 | 2916 | 2916 |
| 4 | 465 | 20 | 6 | 58852 | | | 58852 | | | |
| 5 | 436 | 20 | 6 | 55320 | | | | 55320 | | |
| 6 | 161 | 20 | 8 | 25680 | | | | 25680 | 25680 | |
| 2a | 7 | 20 | 11 | 1540 | 1540 | | | | 1540 | 1540 |
| | 16-ft Tunnel Volumes: | | | | | | | | | |
| 16' | 1980 | 26 | * | 51662 | 51662 | | | | | |
| 16' | 1875 | 26 | * | 48934 | | 48934 | | | | |
| 16' | 1276 | 26 | * | 33304 | | | 33304 | | | |
| 16' | 1384 | 26 | * | 36107 | | | | 36107 | | |
| 16' | 1692 | 26 | * | 44146 | | | | | 44146 | |
| 16' | 1855 | 26 | * | 48412 | | | | | | 48412 |
| Subtotal | | | | | 70137 | 65870 | 127907 | 134043 | 88301 | 66888 |
| Deduct for Equipment** | | | | | 5580 | 5276 | 5389 | 5562 | 5232 | 5240 |
| Total | | | | | 64557 | 60594 | 122518 | 128481 | 83069 | 61648 |

Total 16-ft Tunnel Cross-Sectional Area = 147 sq. ft.

* Value shown in Width column is area (sq ft) of a segment (Aseg, as calculated above) in the tunnel above the given height.

**Scaled value, linear with height

## SEXTANT VOLUMES

Linear dimensions are in feet, volumes in cubic feet

| Type | Length | Width | Height | Volume | Sextant Number 1 | 3 | 5 | 7 | 9 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|
| Calculation of Volume above | | | 4.1 | feet from floor including Attics (for 0<height<11) | | | | | | |
| R = | 8.00 | | | R = radius of circle | | | | | | |
| h = | 6.91 | | | h = sagitta of arc | | | | | | |
| d = | 1.09 | | | d = center to chord = R-h | | | | | | |
| T = | 2.869 | rad | | T = included angle of sector = 2*acos(d/R) | | | | | | |
| = | 164.40 | deg | | | | | | | | |
| l = | 15.85 | | | l = chord length across sector = 2*R*sin(T/2) | | | | | | |
| Acir = | 201.06 | | | Acir = area of circle = Pi*R**2 | | | | | | |
| Asec = | 91.82 | | | Asec = area of whole sector = .5*T*R**2 | | | | | | |
| Aseg = | 83.21 | | | Aseg = area of segment outside of chord = 0.5*(T-sin(T) | | | | | | |
| | Total Arc Length = | | | | 2046 | 1934 | 1976 | 2039 | 1918 | 1921 |
| | Bump Volumes: | | | | | | | | | |
| 1 | 97 | 20 | 10 | 19234 | | | 19234 | | | |
| 2 | 7 | 20 | 15 | 2088 | 2088 | 2088 | 2088 | 2088 | 2088 | 2088 |
| 3 | 78 | 23 | 8 | 14198 | | | 14198 | | | |
| A | 15 | 42 | 8 | 5458 | 5458 | 5458 | 5458 | 5458 | 5458 | 5458 |
| B | 22 | 42 | 14 | 13128 | 13128 | 13128 | 13128 | 13128 | 13128 | 13128 |
| C | 15 | 42 | 8 | 5458 | 5458 | 5458 | 5458 | 5458 | 5458 | 5458 |
| 4 | 465 | 20 | 10 | 97245 | | | 97245 | | | |
| 5 | 436 | 20 | 10 | 91409 | | | | 91409 | | |
| 6 | 161 | 20 | 12 | 38245 | | | | 38245 | 38245 | |
| 2a | 7 | 20 | 15 | 2088 | 2088 | | | | 2088 | 2088 |
| | 16-ft Tunnel Volumes: | | | | | | | | | |
| 16' | 1980 | 83 | * | 164723 | 164723 | | | | | |
| 16' | 1875 | 83 | * | 156027 | | 156027 | | | | |
| 16' | 1276 | 83 | * | 106189 | | | 106189 | | | |
| 16' | 1384 | 83 | * | 115128 | | | | 115128 | | |
| 16' | 1692 | 83 | * | 140758 | | | | | 140758 | |
| 16' | 1855 | 83 | * | 154363 | | | | | | 154363 |
| Subtotal | | | | | 192942 | 182159 | 262997 | 270914 | 207222 | 182583 |
| Deduct for Equipment** | | | | | 12860 | 12159 | 12420 | 12819 | 12058 | 12077 |
| Total | | | | | 180083 | 170000 | 250577 | 258095 | 195164 | 170505 |

Total 16-ft Tunnel Cross-Sectional Area = 147 sq. ft.

* Value shown in Width column is area (sq ft) of a segment (Aseg, as calculated above) in the tunnel above the given height.

**Scaled value, linear with height

## SEXTANT VOLUMES

Linear dimensions are in feet, volumes in cubic feet

| Type | Length | Width | Height | Volume | Sextant Number 1 | 3 | 5 | 7 | 9 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|
| Calculation of Volume above | | | 4.1 | feet from floor including Attics (for 0<height<11) | | | | | | |
| R = | 8.00 | | | R = radius of circle | | | | | | |
| h = | 6.90 | | | h = sagitta of arc | | | | | | |
| d = | 1.10 | | | d = center to chord = R-h | | | | | | |
| T = | 2.865 | rad | | T = included angle of sector = 2*acos(d/R) | | | | | | |
| = | 164.16 | deg | | | | | | | | |
| l = | 15.85 | | | l = chord length across sector = 2*R*sin(T/2) | | | | | | |
| Acir = | 201.06 | | | Acir = area of circle = Pi*R**2 | | | | | | |
| Asec = | 91.68 | | | Asec = area of whole sector = .5*T*R**2 | | | | | | |
| Aseg = | 82.95 | | | Aseg = area of segment outside of chord = 0.5*(T-sin(T) | | | | | | |
| | Total Arc Length = | | | | 2046 | 1934 | 1976 | 2039 | 1918 | 1921 |
| | Bump Volumes: | | | | | | | | | |
| 1 | 97 | 20 | 10 | 19201 | | | 19201 | | | |
| 2 | 7 | 20 | 15 | 2086 | 2086 | 2086 | 2086 | 2086 | 2086 | 2086 |
| 3 | 78 | 23 | 8 | 14168 | | | 14168 | | | |
| A | 15 | 42 | 8 | 5447 | 5447 | 5447 | 5447 | 5447 | 5447 | 5447 |
| B | 22 | 42 | 14 | 13113 | 13113 | 13113 | 13113 | 13113 | 13113 | 13113 |
| C | 15 | 42 | 8 | 5447 | 5447 | 5447 | 5447 | 5447 | 5447 | 5447 |
| 4 | 465 | 20 | 10 | 97080 | | | 97080 | | | |
| 5 | 436 | 20 | 10 | 91254 | | | | 91254 | | |
| 6 | 161 | 20 | 12 | 38191 | | | | 38191 | 38191 | |
| 2a | 7 | 20 | 15 | 2086 | 2086 | | | | 2086 | 2086 |
| | 16-ft Tunnel Volumes: | | | | | | | | | |
| 16' | 1980 | 83 | * | 164196 | 164196 | | | | | |
| 16' | 1875 | 83 | * | 155529 | | 155529 | | | | |
| 16' | 1276 | 83 | * | 105850 | | | 105850 | | | |
| 16' | 1384 | 83 | * | 114761 | | | | 114761 | | |
| 16' | 1692 | 83 | * | 140308 | | | | | 140308 | |
| 16' | 1855 | 83 | * | 153870 | | | | | | 153870 |
| Subtotal | | | | | 192375 | 181621 | 262391 | 270298 | 206677 | 182048 |
| Deduct for Equipment** | | | | | 12829 | 12129 | 12390 | 12788 | 12029 | 12048 |
| Total | | | | | 179546 | 169492 | 250002 | 257511 | 194648 | 170000 |

Total 16-ft Tunnel Cross-Sectional Area = 147 sq. ft.

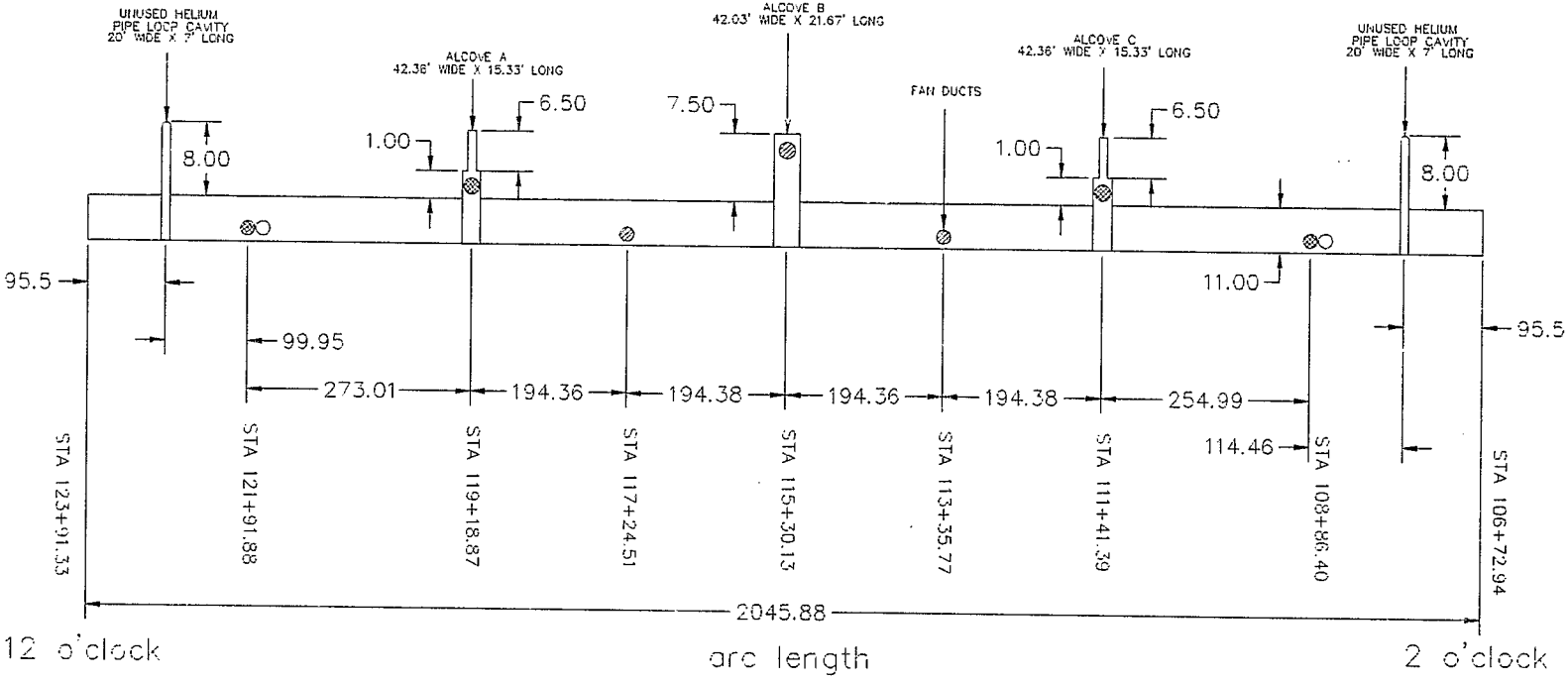
* Value shown in Width column is area (sq ft) of a segment (Aseg, as calculated above) in the tunnel above the given height.

**Scaled value, linear with height

NOTES:

| REVISIONS | | | | | | | |
|---|---|---|---|---|---|---|---|
| REV | ZONE | ECN NO. | DESCRIPTION | BY | DATE | CKR | APP |
| A | | | INITIAL RELEASE | MJA | 10/31/94 | SN | DPB |

- 4.0' DIAMETER DUCT
- 3.5' DIAMETER DUCT
- 2ND DUCT OF PAIR LOCATED OPPOSITE SIDE OF ENCLOSURE




| OUTSTANDING ECN NUMBERS | INTERPRET IN GENERAL ACCORDANCE WITH ASME Y14.24M-1989 | | | |
|---|---|---|---|---|
| | UNLESS OTHERWISE SPECIFIED | DRAWN BY | M.ALINGER | 8/11/94 |
| | DIMENSIONS ARE IN INCHES DECIMAL TOLERANCES .X ± .06 .XX ± .02 .XXX ± .005 ANGULAR TOLERANCE ± 1° | DESIGN APPROVAL | D.P. Brown | 10/28/94 |
| | | CHECKED BY | S. Norton | 10/31/94 |
| | | ENGINEER APPROVAL | D.P. Brown | 10/28/94 |
| | | SUPERVISOR APPROVAL | D.P. Brown | 10/28/94 |
| | | QA APPROVAL | T.R. Muller | 10/31/94 |
| | | SAFETY ENGINEERING | R. Alforque | 10/31/94 |
| | NA FINISH — BREAK SHARP EDGES MAX. NA MIN. NA | | | |

RHIC

BROOKHAVEN NATIONAL LABORATORY
ASSOCIATED UNIVERSITIES, INC.
UPTON, N.Y. 11973

TITLE: MAGNET ENCLOSURE ELEV SEXTANT 1, FAN DUCTS

| SIZE | DRAWING NUMBER: | REV. |
|---|---|---|
| C | 01055065 | A |

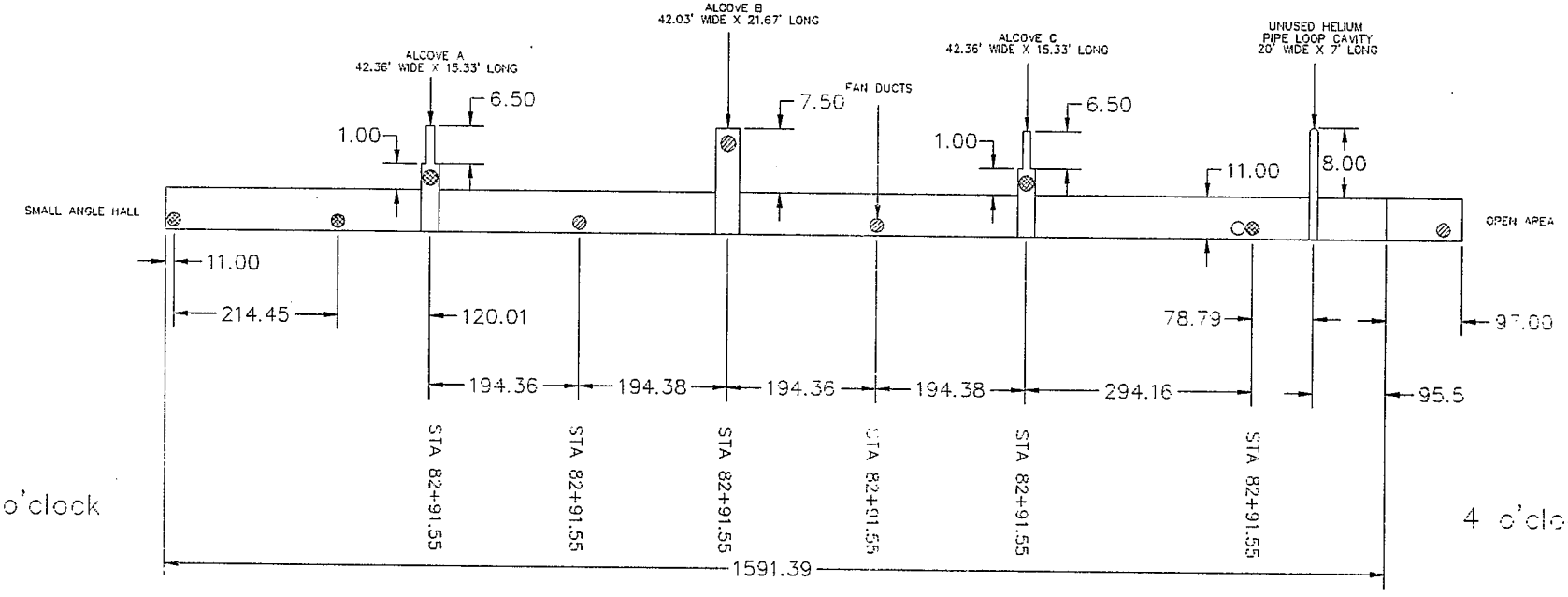
Q.A. CATEGORY: NA | SCALE NONE | WEIGHT: NA | SHEET 1 OF 1

DWG NO 01055065 | SHT 1 OF 1 | REV A

NOTES:

| REVISIONS | | | | | | | |
|---|---|---|---|---|---|---|---|
| REV | ZONE | ECN NO. | DESCRIPTION | BY | DATE | CKR | APP |
| A | | | INITIAL RELEASE | MJA | 10/31/94 | SN | DPB |

- 4.0' DIAMETER DUCT
- 3.5' DIAMETER DUCT
- 2ND DUCT OF PAIR LOCATED OPPOSITE SIDE OF ENCLOSURE



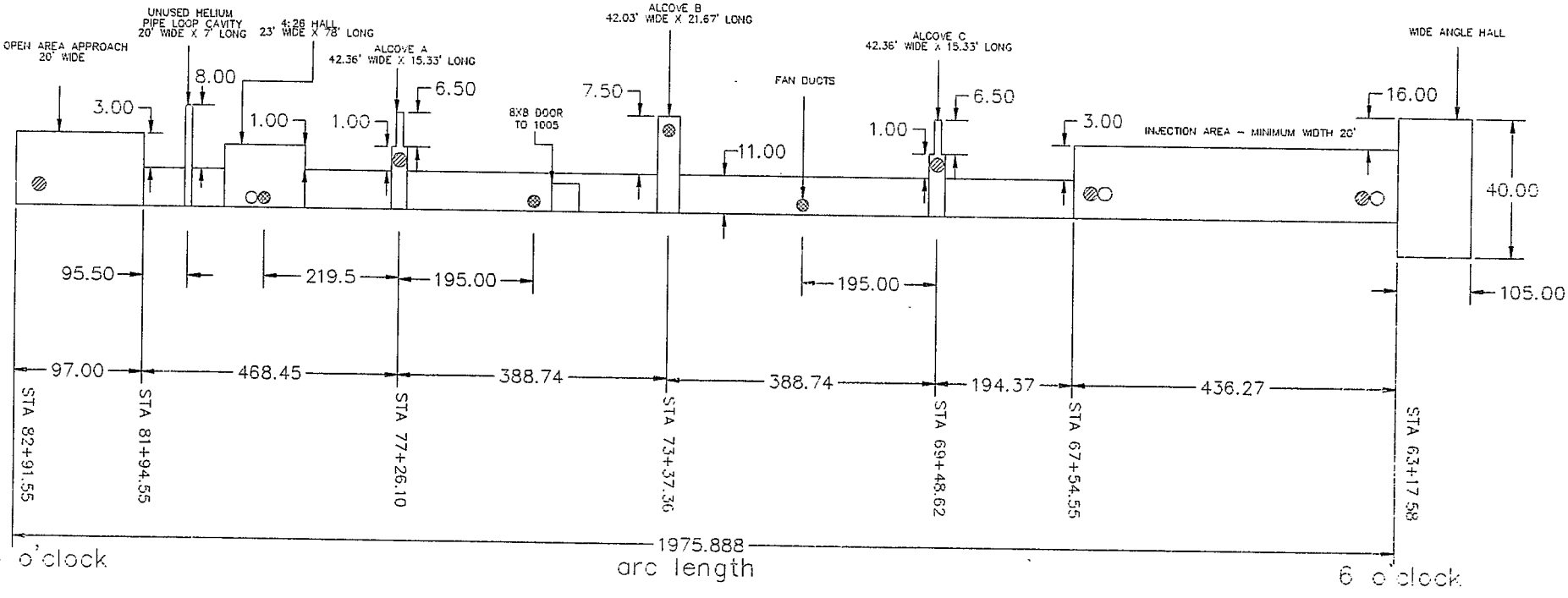

| | | | | | |
|---|---|---|---|---|---|
| OUTSTANDING ECN NUMBERS | INTERPRET IN GENERAL ACCORDANCE WITH ASME Y14.24M–1989 | RHIC | | | BROOKHAVEN NATIONAL LABORATORY, ASSOCIATED UNIVERSITIES, INC., UPTON, N.Y. 11973 |
| | UNLESS OTHERWISE SPECIFIED | DRAWN BY | M.ALINGER | 8/12/94 | TITLE: MAGNET ENCLOSURE ELEV. SEXTANT 3, FAN DUCTS |
| | DIMENSIONS ARE IN INCHES DECIMAL TOLERANCES .X ± .03, .XX ± .02, .XXX ± .005, ANGULAR TOLERANCE ± 1° | DESIGN APPROVAL | D.P. Brown | 10/28/94 | |
| | | CHECKED BY | S. Norton | 10/31/94 | |
| | | ENGINEER APPROVAL | D.P. Brown | 10/28/94 | |
| | | SUPERVISOR APPROVAL | D.P. Brown | 10/28/94 | |
| | NA FINISH | Q.A. APPROVAL | T.R. Muller | 10/31/94 | SIZE C, DRAWING NUMBER: 01055066, REV. A |
| | BREAK SHARP EDGES MAX. NA MIN. NA | SAFETY ENGINEERING | R. Alforque | 10/31/94 | Q.A. CATEGORY: NA, SCALE: NONE, WEIGHT: NA, SHEET 1 OF 1 |

DWG NO 01055066 SHT 1 OF 1 REV A

NOTES:

- 4.0' DIAMETER DUCT
- 3.5' DIAMETER DUCT
- 2ND DUCT OF PAIR LOCATED OPPOSITE SIDE OF ENCLOSURE

| REVISIONS | | | | | | | |
|---|---|---|---|---|---|---|---|
| REV | ZONE | ECN NO. | DESCRIPTION | BY | DATE | CKR | APP |
| A | | | INITIAL RELEASE | MJA | 10/31/94 | SN | DPB |



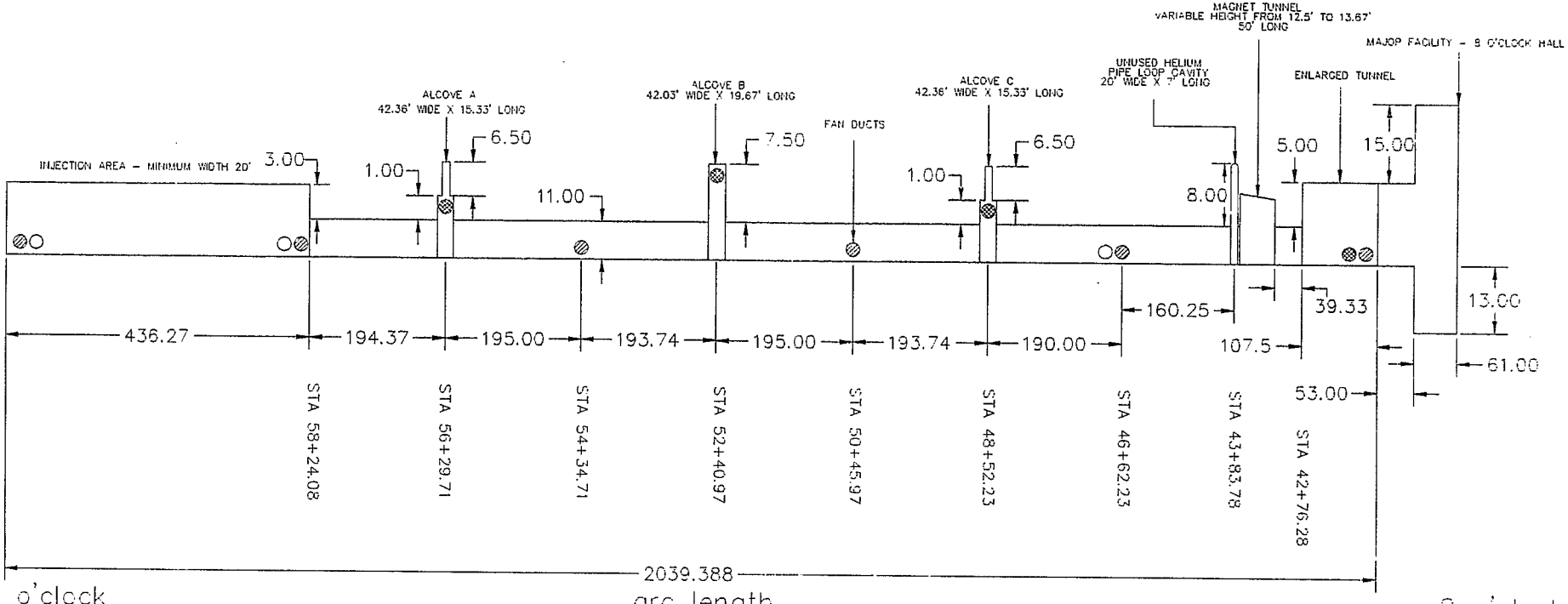

| | | | | | |
|---|---|---|---|---|---|
| OUTSTANDING ECN NUMBERS | INTERPRET IN GENERAL ACCORDANCE WITH ASME Y14.24M-1989 | RHIC | | | BROOKHAVEN NATIONAL LABORATORY ASSOCIATED UNIVERSITIES, INC. UPTON, N.Y. 11973 |
| | UNLESS OTHERWISE SPECIFIED | DRAWN BY | M.ALINGER | 7/25/94 | TITLE: MAGNET ENCLOSURE ELEV SEXTANT 5, FAN DUCTS |
| | DIMENSIONS ARE IN INCHES DECIMAL TOLERANCES .X ± .09 .XX ± .03 .XXX ± .005 ANGULAR TOLERANCE ± 1° | DESIGN APPROVAL | D.P. Brown | 10/28/94 | |
| | | CHECKED BY | S. Norton | 10/31/94 | |
| | | ENGINEER APPROVAL | D.P. Brown | 10/28/94 | |
| | | SUPERVISOR APPROVAL | D.P. Brown | 10/28/94 | SIZE C DRAWING NUMBER: 01055057 REV. A |
| | NA FINISH BREAK SHARP EDGES MAX. NA MIN. NA | Q.A. APPROVAL | T.R. Muller | 10/31/94 | |
| | | SAFETY ENGINEERING | R. Alforque | 10/31/94 | Q.A. CATEGORY: NA SCALE: NONE WEIGHT: NA SHEET 1 OF 1 |

DWG NO 01055057 SHT 1 OF 1 REV B

NOTES:

- ⊘ 4.0' DIAMETER DUCT
- ⊗ 3.5' DIAMETER DUCT
- ○ 2ND DUCT OF PAIR LOCATED OPPOSITE SIDE OF ENCLOSURE

| REVISIONS | | | | | | | |
|---|---|---|---|---|---|---|---|
| REV | ZONE | ECN NO. | DESCRIPTION | BY | DATE | CKR | APP |
| A | | | INITIAL RELEASE | MJA | 10/31/94 | SN | DPB |



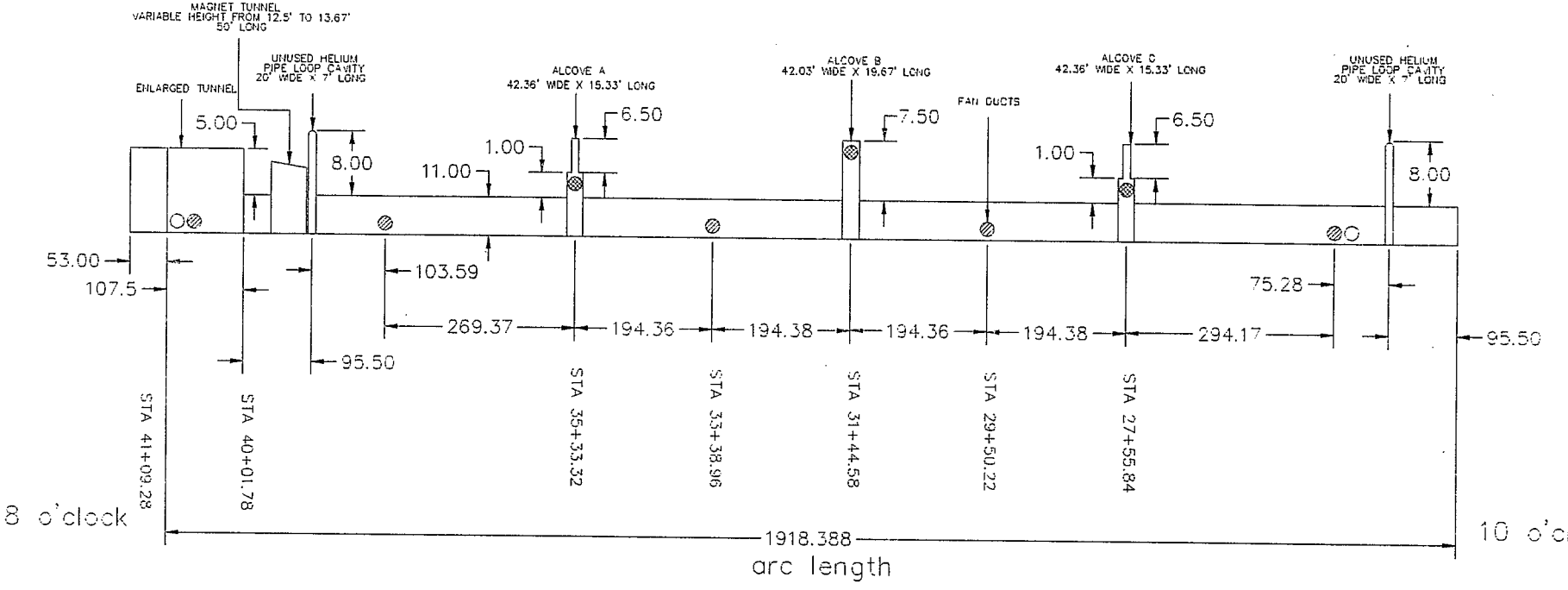

| | | | | | |
|---|---|---|---|---|---|
| OUTSTANDING ECN NUMBERS | INTERPRET IN GENERAL ACCORDANCE WITH ASME Y14.24M–1989 | RHIC | | | BROOKHAVEN NATIONAL LABORATORY<br>ASSOCIATED UNIVERSITIES, INC.<br>UPTON, N.Y. 11973 |
| | UNLESS OTHERWISE SPECIFIED | DRAWN BY | M.ALINGER | 8/1/94 | TITLE: MAGNET ENCLOSURE ELEV SEXTANT 7, FAN DUCTS |
| | DIMENSIONS ARE IN INCHES<br>DECIMAL TOLERANCES<br>.X ± .08<br>.XX ± .02<br>.XXX ± .005<br>ANGULAR TOLERANCE ± 1° | DESIGN APPROVAL | D.P. Brown | 10/28/94 | |
| | | CHECKED BY | S. Norton | 10/31/94 | |
| | | ENGINEER APPROVAL | D.P Brown | 10/28/94 | |
| | | SUPERVISOR APPROVAL | D.P. Brown | 10/28/94 | SIZE C — DRAWING NUMBER 01055058 — REV. A |
| | NA ✓ FINISH — BREAK SHARP EDGES MIN. NA MIN. NA | Q.A. APPROVAL | T.R. Muller | 10/31/94 | |
| | | SAFETY ENGINEERING | R. Alforque | 10/31/94 | Q.A. CATEGORY: NA — SCALE NONE — WEIGHT: NA — SHEET 1 OF 1 |

DWG NO 01055058 — REV A — SHT 1 OF 1

NOTES:

| REVISIONS | | | | | | | |
|---|---|---|---|---|---|---|---|
| REV | ZONE | ECN NO. | DESCRIPTION | BY | DATE | CKR | APP |
| A | | | INITIAL RELEASE | MJA | 10/31/94 | SN | DPB |

- ⊘ 4.0' DIAMETER DUCT
- ⊗ 3.5' DIAMETER DUCT
- ○ 2ND DUCT OF PAIR LOCATED OPPOSITE SIDE OF ENCLOSURE



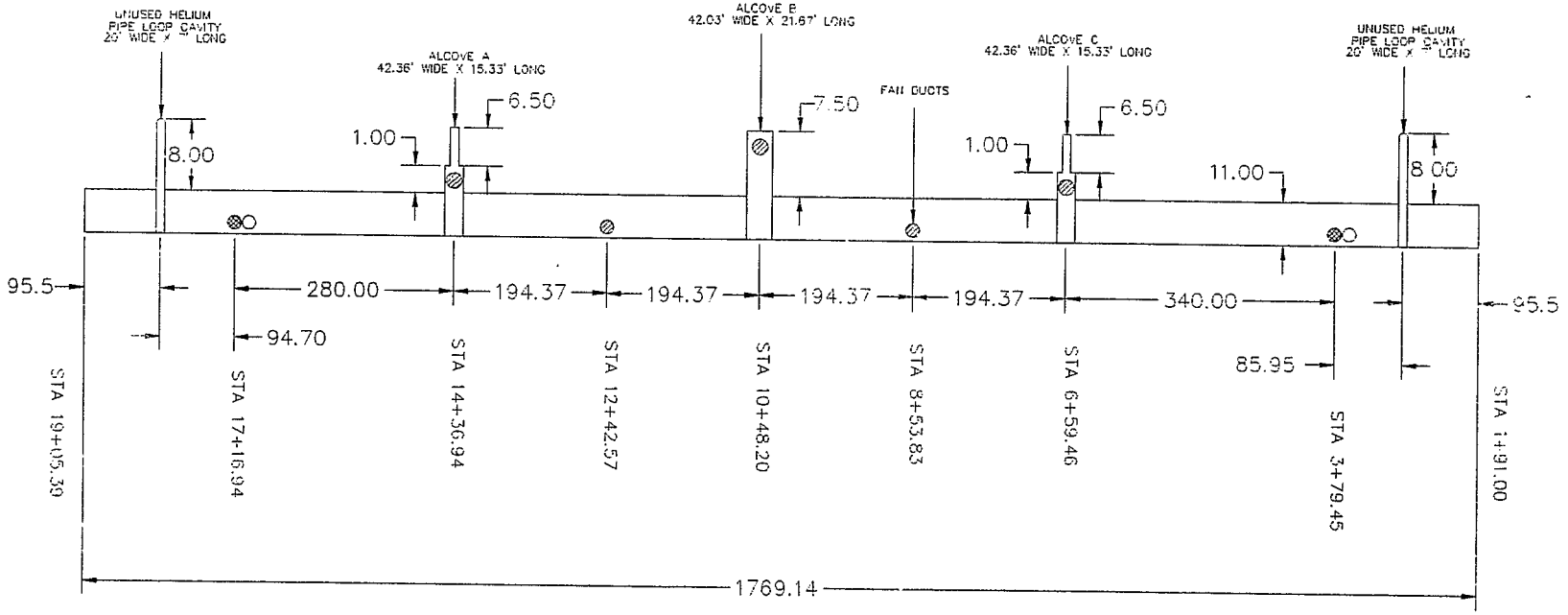

| | | | | | |
|---|---|---|---|---|---|
| OUTSTANDING ECN NUMBERS | INTERPRET IN GENERAL ACCORDANCE WITH ASME Y14.24M-1989 | RHIC | | | BROOKHAVEN NATIONAL LABORATORY<br>ASSOCIATED UNIVERSITIES, INC.<br>UPTON, N.Y. 11973 |
| | UNLESS OTHERWISE SPECIFIED | DRAWN BY | M.ALINGER | 8/3/94 | TITLE: MAGNET ENCLOSURE ELEV SEXTANT 9, FAN DUCTS |
| | DIMENSIONS ARE IN INCHES<br>DECIMAL TOLERANCES<br>.X ± .06<br>.XX ± .02<br>.XXX ± .005<br>ANGULAR TOLERANCE ± 1° | DESIGN APPROVAL | D.P. Brown | 10/28/94 | |
| | | CHECKED BY | S. Norton | 10/31/94 | |
| | | ENGINEER APPROVAL | D.P. Brown | 10/28/94 | |
| | | SUPERVISOR APPROVAL | D.P. Brown | 10/28/94 | SIZE C — DRAWING NUMBER: 01055061 — REV. A |
| | NA<br>FINISH<br>BREAK SHARP EDGES<br>MAX. NA MIN. NA | Q.A. APPROVAL | T.R. Muller | 10/31/94 | |
| | | SAFETY ENGINEERING | R. Alforque | 10/31/94 | Q.A. CATEGORY: NA — SCALE NONE — WEIGHT: NA — SHEET 1 OF 1 |

DWG NO 01055061 | SHT 1 OF 1 | REV A

NOTES:

| REVISIONS | | | | | | | |
|---|---|---|---|---|---|---|---|
| REV | ZONE | ECN NO. | DESCRIPTION | BY | DATE | CKR | APP |
| A | | | INITIAL RELEASE | MJA | 10/31/94 | SN | DPB |

- 4.0' DIAMETER DUCT
- 3.5' DIAMETER DUCT
- 2ND DUCT OF PAIR LOCATED OPPOSITE SIDE OF ENCLOSURE

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|---|---|---|---|---|---|
| OUTSTANDING ECN NUMBERS | INTERPRET IN GENERAL ACCORDANCE WITH ASME Y14.24M–1989 | RHIC | | | BROOKHAVEN NATIONAL LABORATORY ASSOCIATED UNIVERSITIES, INC. UPTON, N.Y. 11973 |
| | UNLESS OTHERWISE SPECIFIED | DRAWN BY | M.ALINGER | 8/10/94 | TITLE: MAGNET ENCLOSURE ELEV. SEXTANT 11. FAN DUCTS |
| | DIMENSIONS ARE IN INCHES DECIMAL TOLERANCES .X ± .06 .XX ± .02 .XXX ± .005 ANGULAR TOLERANCE ± 1° | DESIGN APPROVAL | D.P. Brown | 10/28/94 | |
| | | CHECKED BY | S. Norton | 10/31/94 | |
| | | ENGINEER APPROVAL | D.P. Brown | 10/28/94 | |
| | | SUPERVISOR APPROVAL | D.P. Brown | 10/28/94 | SIZE C — DRAWING NUMBER: 01055064 — REV. A |
| | NA FINISH — BREAK SHARP EDGES MAX. NA MIN. NA | Q.A. APPROVAL | T.R. Muller | 10/31/94 | |
| | | SAFETY/ENGINEERING | R. Alforque | 10/31/94 | Q.A. CATEGORY: NA — SCALE NONE — WEIGHT: NA — SHEET 1 OF 1 |

DWG NO 01055064 — REV A — SHT 1 OF 1