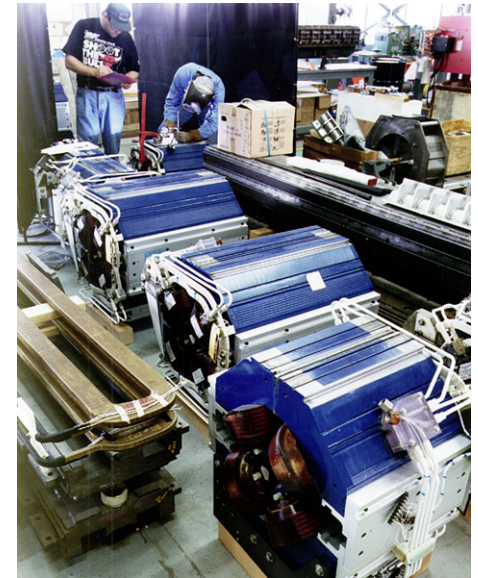


Storage Ring Quadrupole Magnets

There are 400 quadrupole magnets in the storage ring. There are one of each quadrupole magnet in each sector identified as followed: AQ1, AQ2, AQ3, AQ4, AQ5, BQ5, BQ4, BQ3, BQ2, and BQ1. There are three lengths of quadrupole magnets in the storage ring (0.5 m, 0.6 m, and 0.8 m). The AQ1, AQ3, AQ4, BQ4, BQ3, and BQ1 are 0.5 m long magnets. The AQ2 and BQ2 are 0.8 m long magnets. And the AQ5 and BQ5 are 0.6 m long magnets. There are a total of eight different magnet configurations. These configurations are shown in figures 1 through 8.

In addition to these quadrupole magnets there are also nineteen skewed quadrupole magnets in the storage ring. Skewed quadrupole magnets are quadrupole magnets rotated 45°. These magnets are identified as AQS or BQS and are located in the odd sectors from 3 through 39. The AQS skew quadrupole magnet is shown in figure 9.



Storage Ring Quadrupole Magnets

Parameters for the Storage Ring Qudrupole Magnets

	Q2	Q5	Q1,Q3,Q4	
Number Required	80	80	240	
Strength at 7.0 GeV	18.9	18.9	18.9	T/m
Effective Length	0.8	0.6	0.5	m
Gap Height or Diameter	80	80	80	mm
Total mass of Magnet	1815	1374	1153	kg
Beam stay clear				
Horizontal	±35.0	±35.0	±35.0	mm
Vertical	±20.0	±20.0	±20.0	mm
Coils per Pole	1	1	1	
Conductor				
Height	11.5	11.5	11.5	mm
Width	11.5	11.5	11.5	mm
Hole Diameter	6.3	6.3	6.3	mm
Number of Turns per Pole	32	32	32	
Total Inductance	27	20	17	mH
Total Resistance	44	35	30	mΩ
Time Constant	614	571	567	ms
Peak Current	412	412	412	A
Current Density in Coil	2.6	2.6	2.6	A/mm ²
Voltage	18.3	14.3	12.3	V
Power	7.5	5.9	5.1	kW
Cooling Water Circuits per Magnet	4	4	4	
Total Water Flow	2.8*	3.2*	3.4*	gpm
Water Pressure Drop	40*	40*	40*	psi
Water Temperature Rise	13*	9*	7*	°C

*Will be redesigned at 80 psi

Storage Ring Quadrupole Magnets

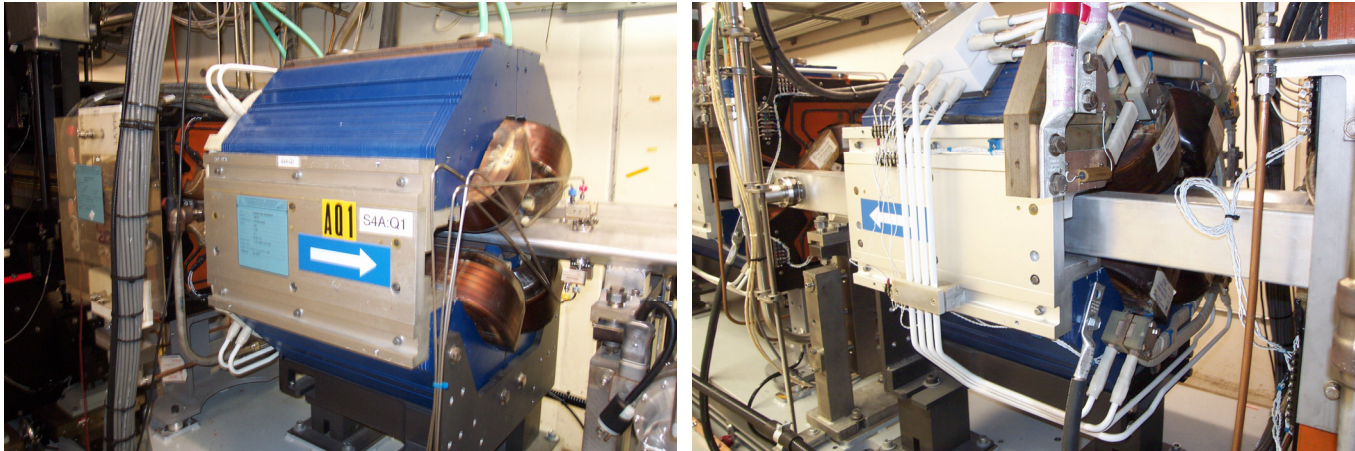


Figure1: AQ1 (31010203-00029) Quadrupole Magnet (0.5 m) is shown. The AQ3 and BQ4 are identical to this magnet.

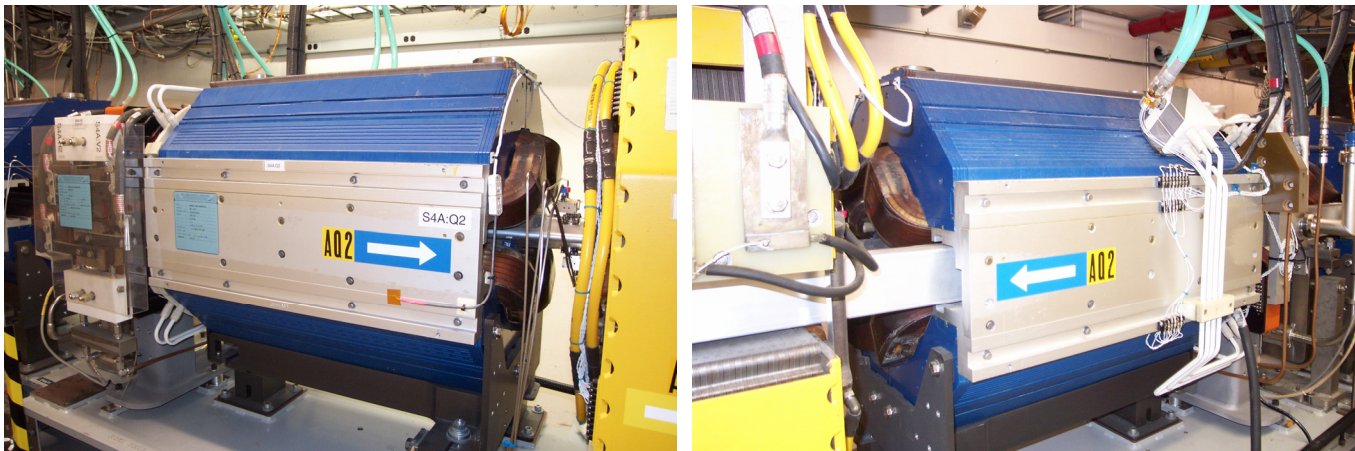


Figure2: AQ2 (31010201-00101) Quadrupole Magnet (0.8 m)

Storage Ring Quadrupole Magnets

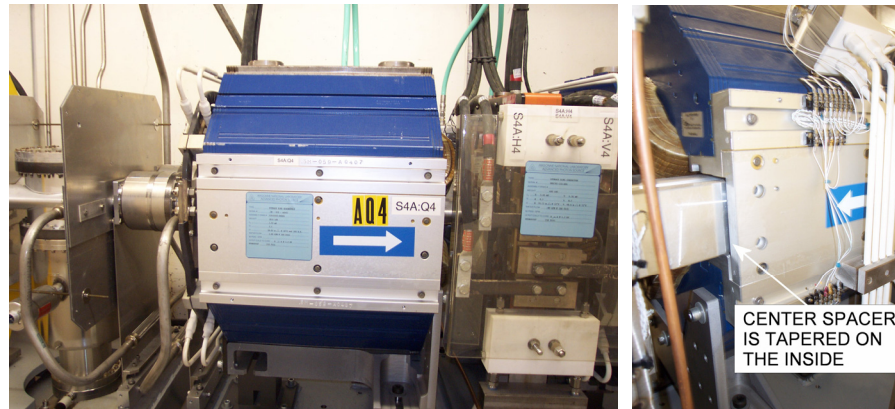


Figure3: AQ4 (31010203-00031) Quadrupole Magnet (0.5 m). Notice the center spacer is tapered on the inside to clear the vacuum chamber.

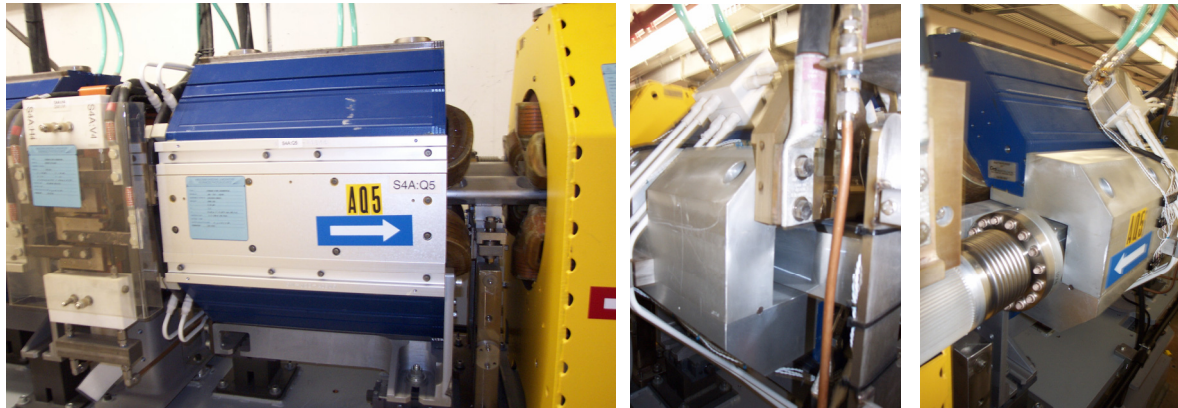


Figure4: AQ5 (31010202-00027) Quadrupole Magnet (0.6 m). Notice the special center spacer that straddles the vacuum chamber. Also notice the special cooling tubes around the center spacer.

Storage Ring Quadrupole Magnets

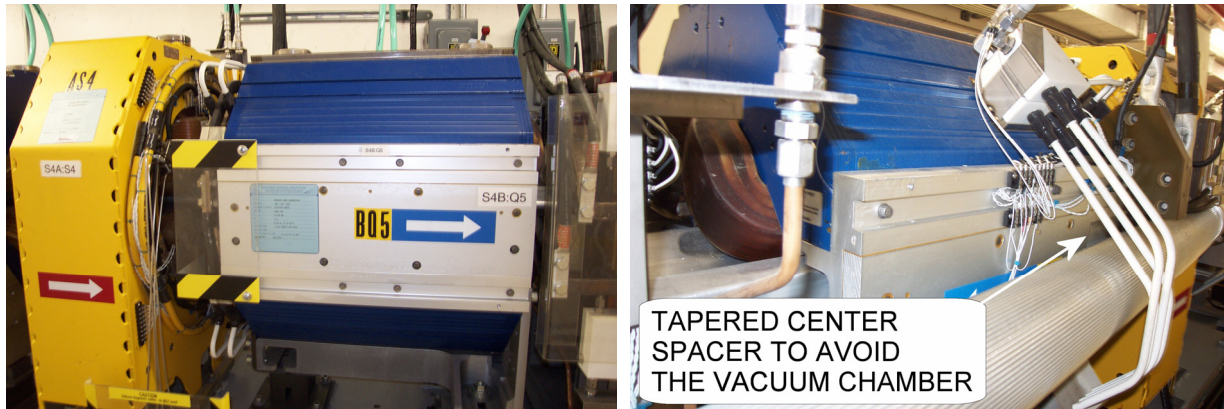


Figure5: BQ5 (31010202-00028) Quadrupole Magnet (0.6 m). Notice the tapered center spacer that clears the vacuum chamber. Also notice the special cooling tubes around the vacuum chamber.

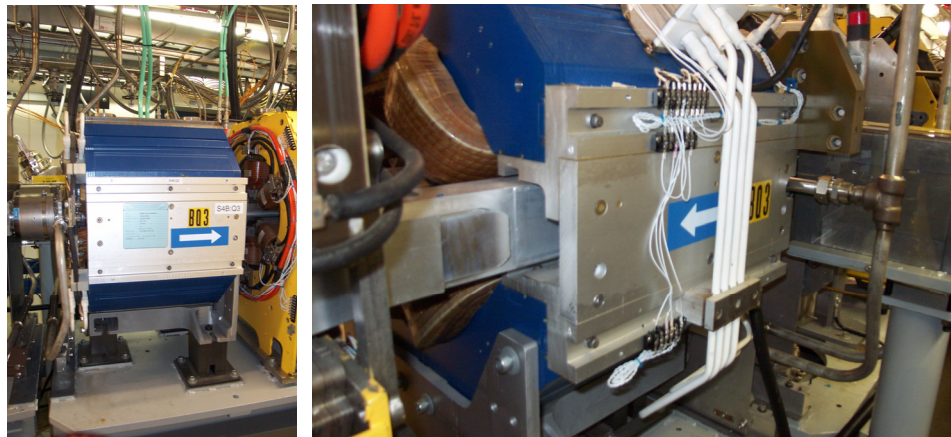


Figure6: BQ3 (31010203-500000) Quadrupole Magnet (0.5 m). Notice the slot in the center spacer to clear the cooling pipe.

Storage Ring Quadrupole Magnets

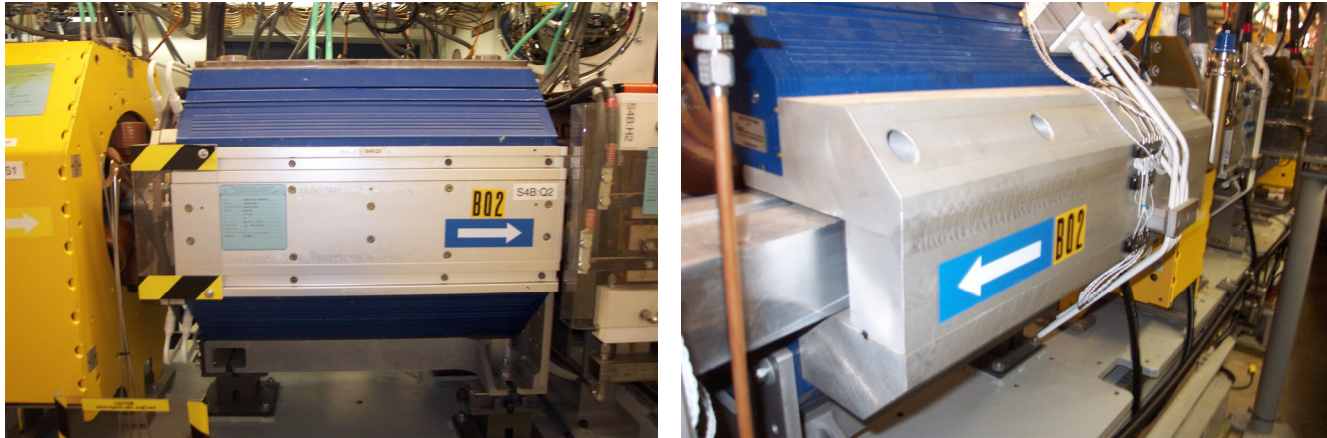


Figure7: BQ2 (31010201-00102) Quadrupole Magnet (0.8 m). Also notice the special cooling tubes around the center spacer.

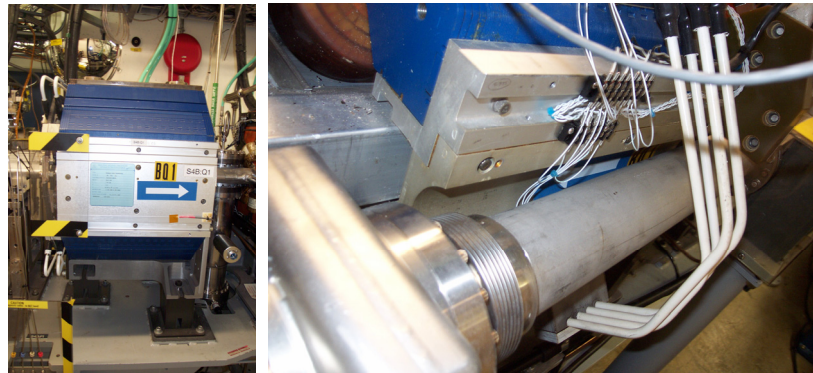
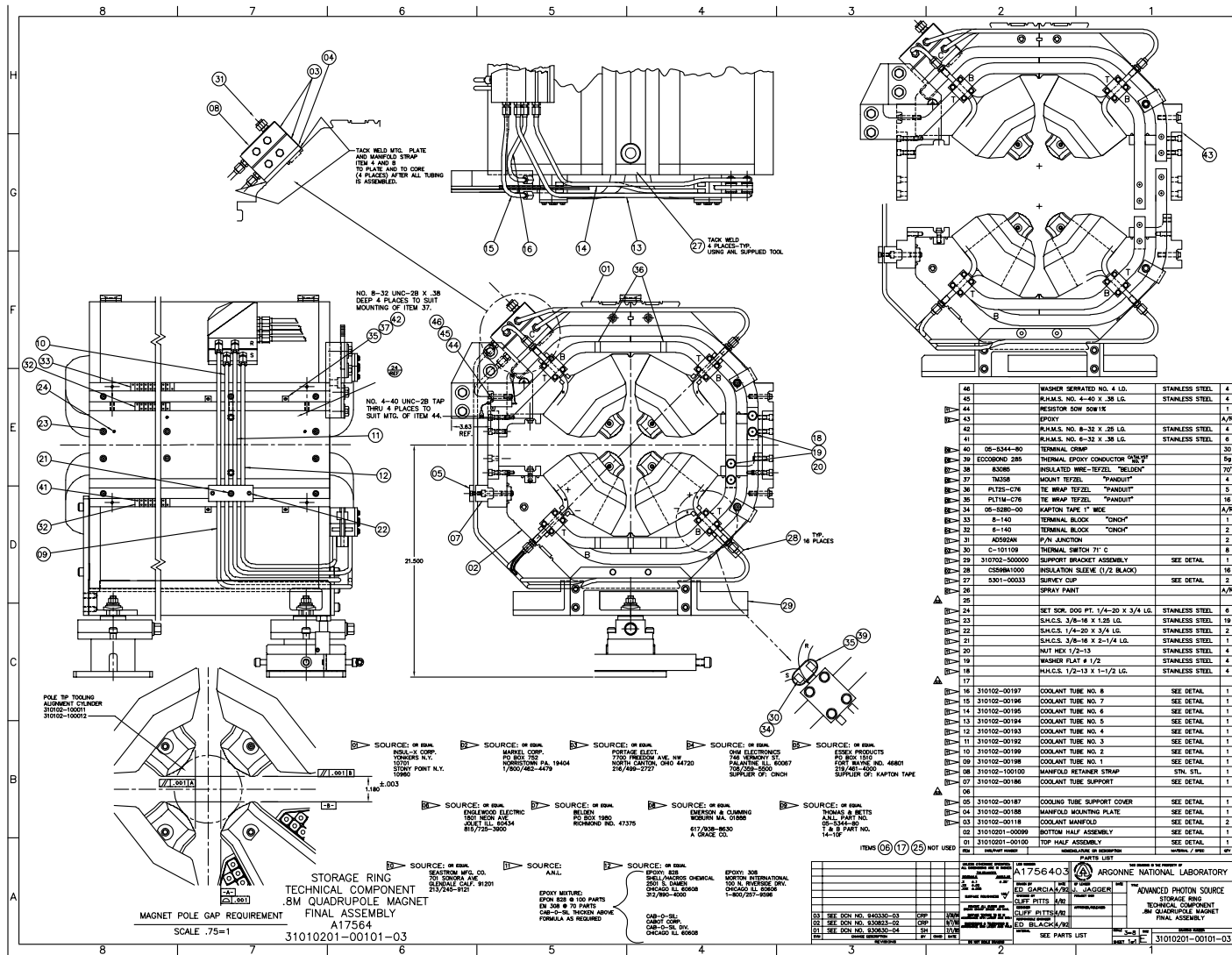


Figure8: BQ1 (31010203-00030) Quadrupole Magnet (0.5 m). Notice the radial cut out of the center spacer to clear the vacuum chamber. Also notice the special cooling tubes around the vacuum chamber.

Storage Ring Quadrupole Magnets

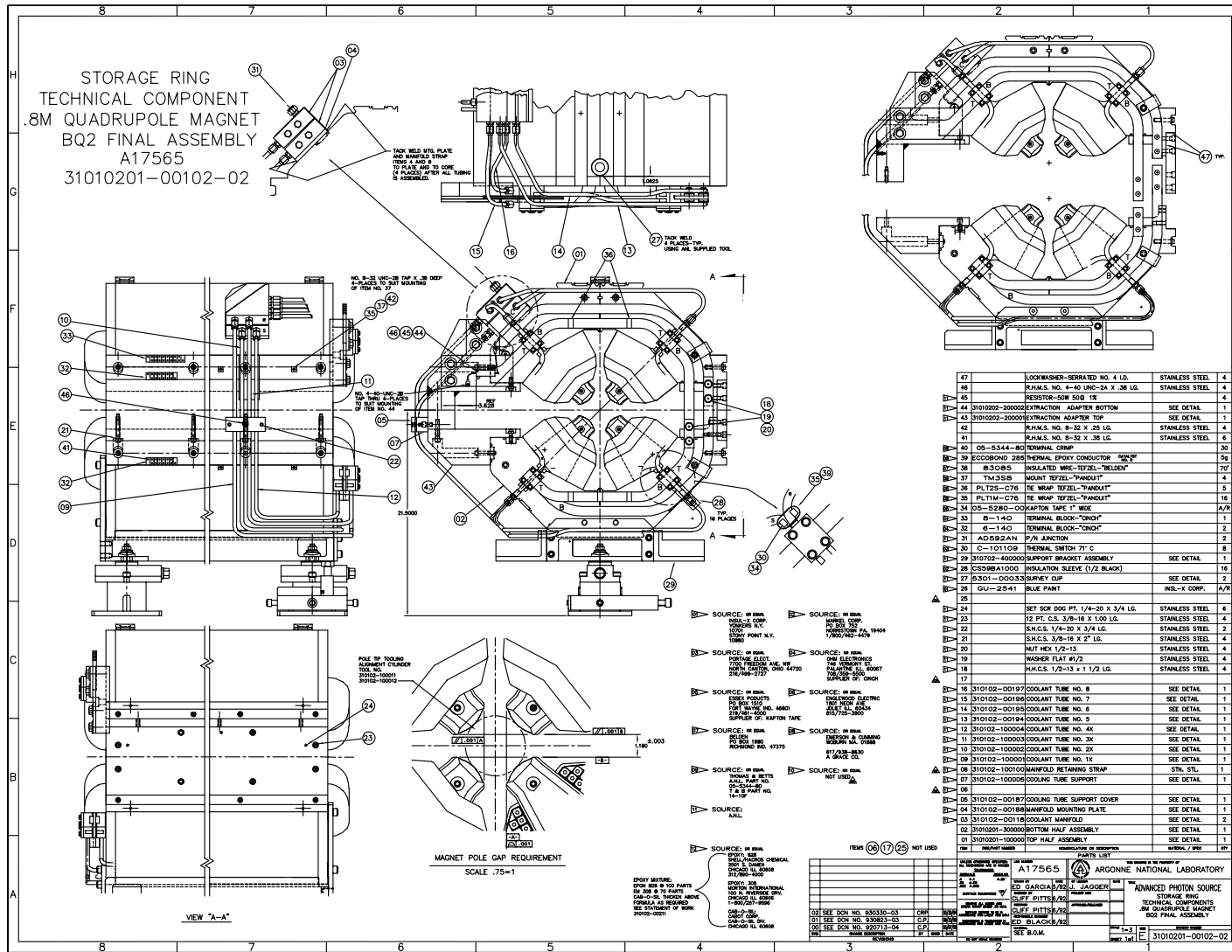


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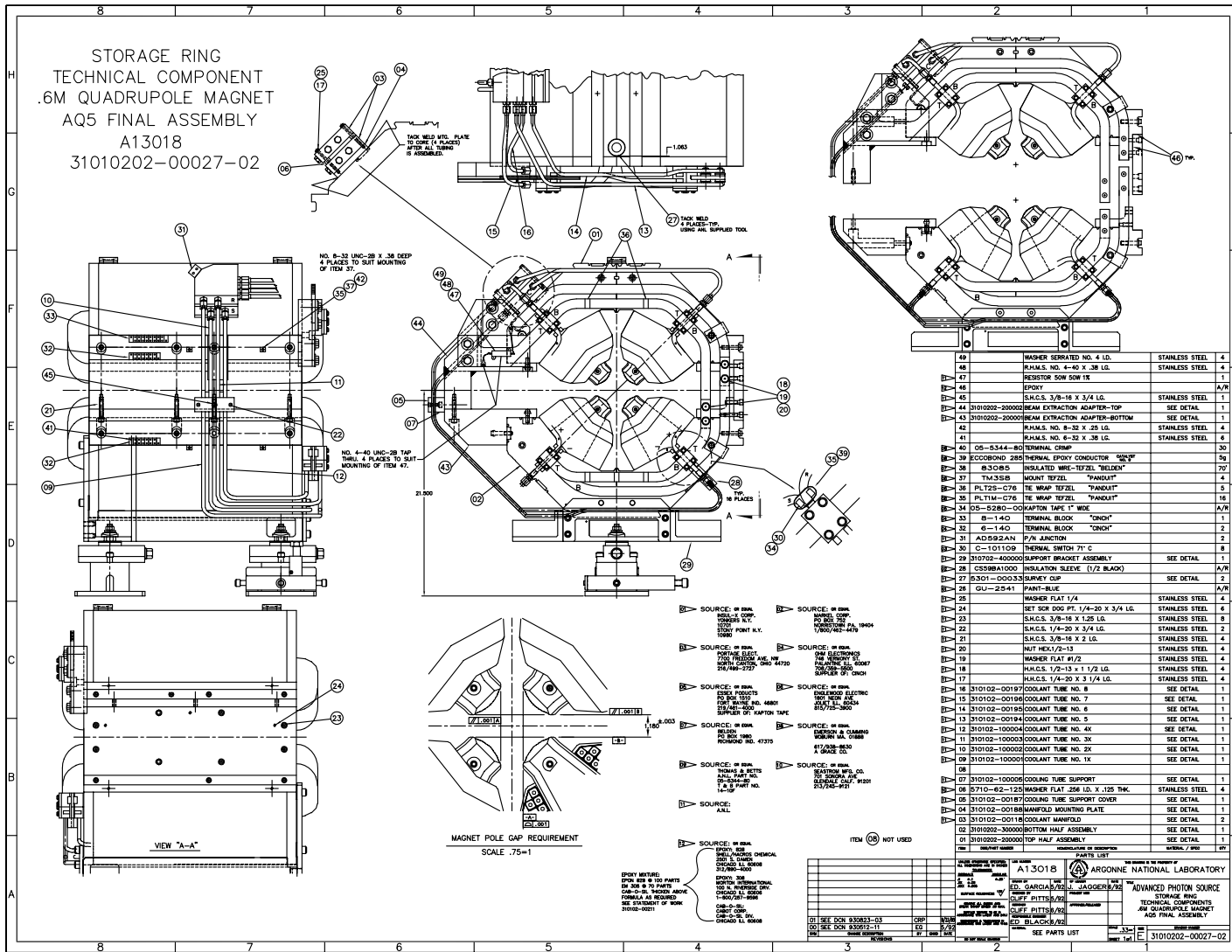


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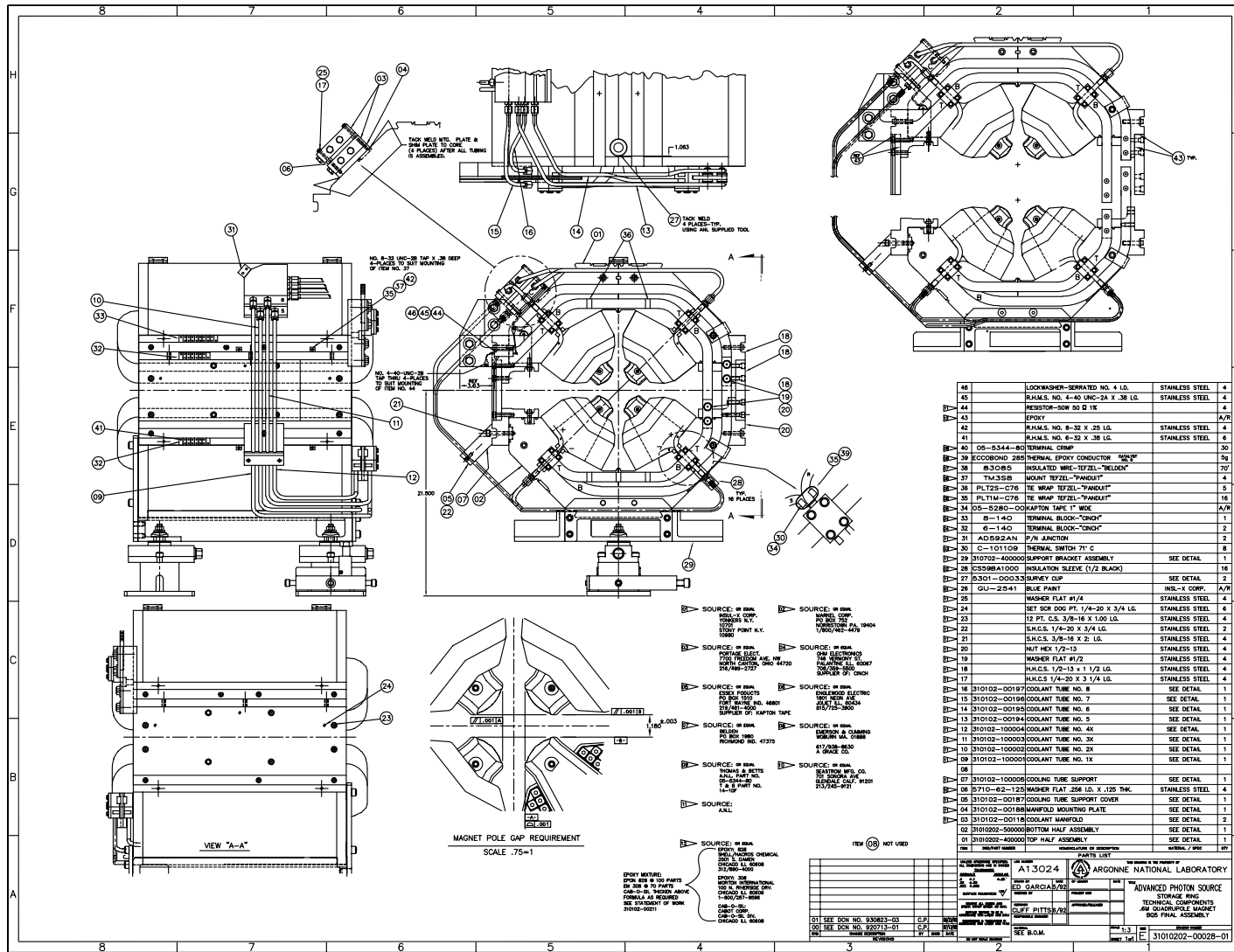


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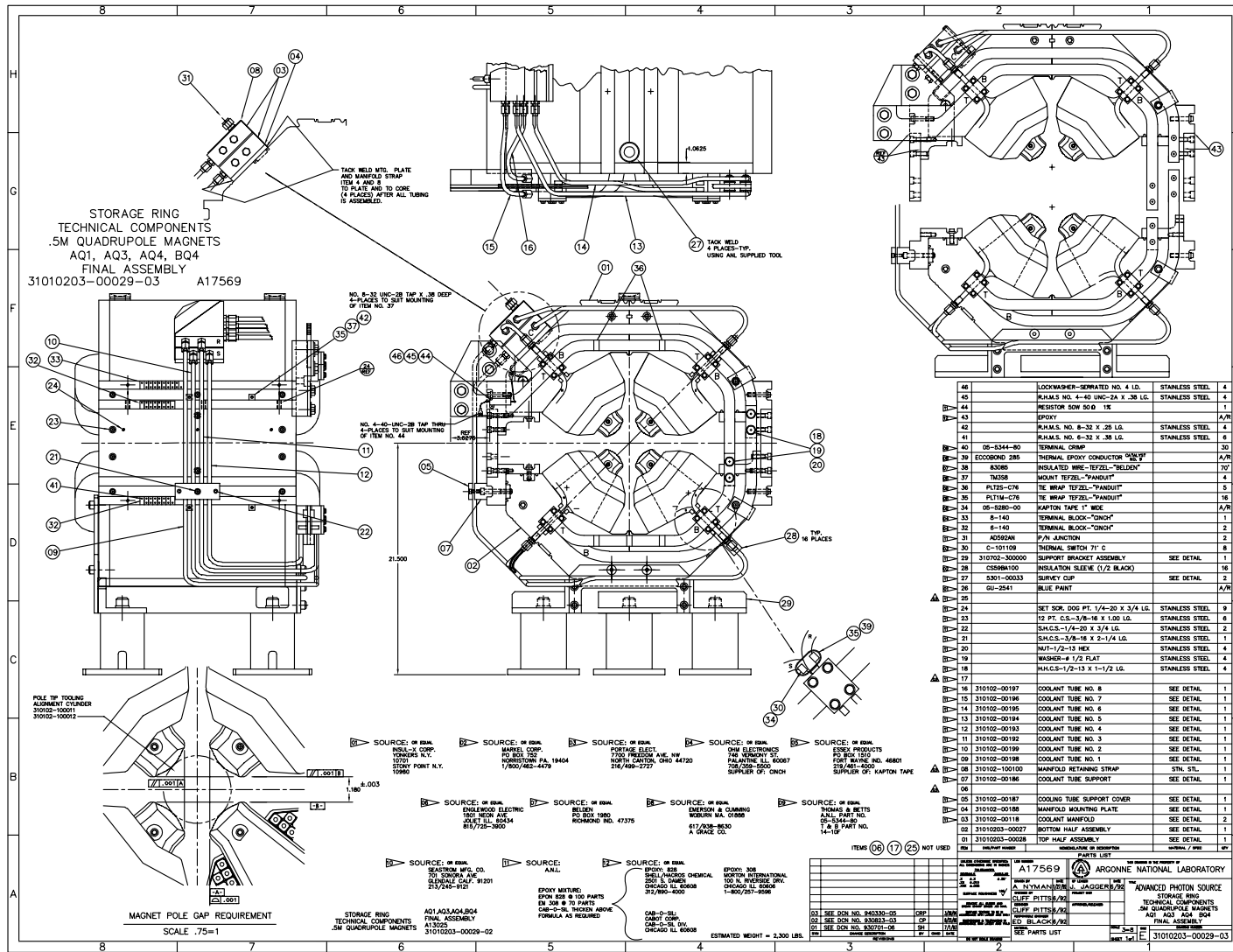


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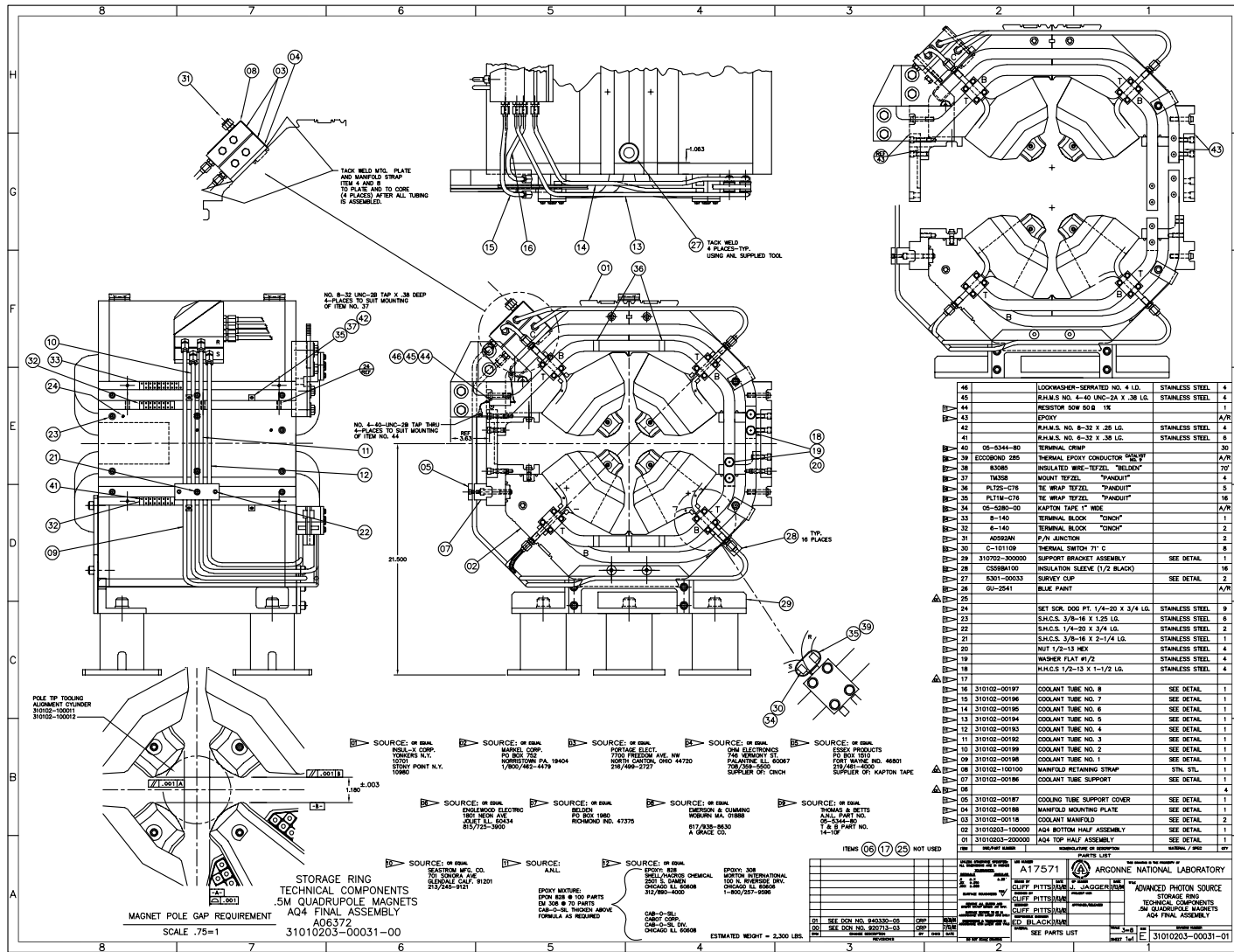


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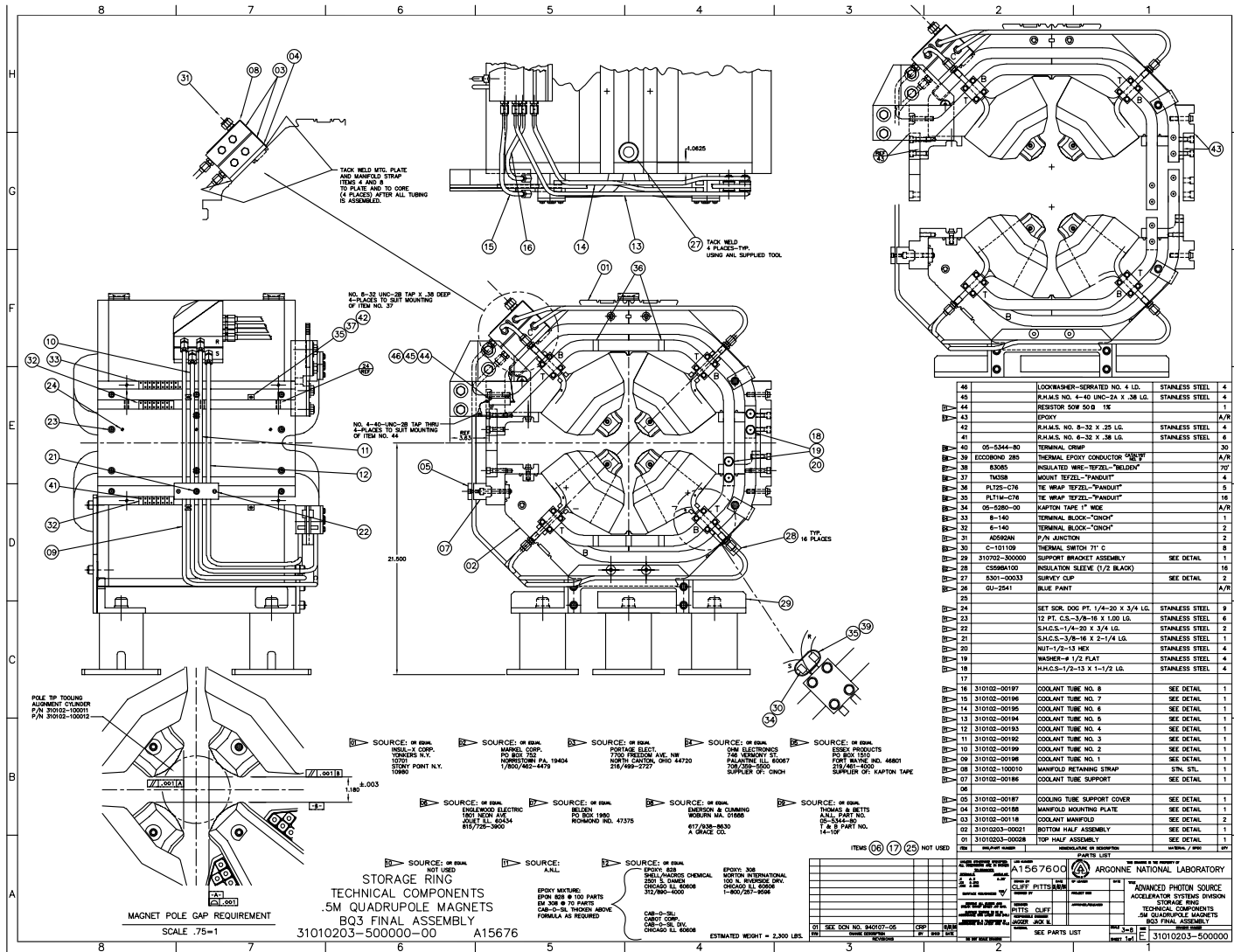
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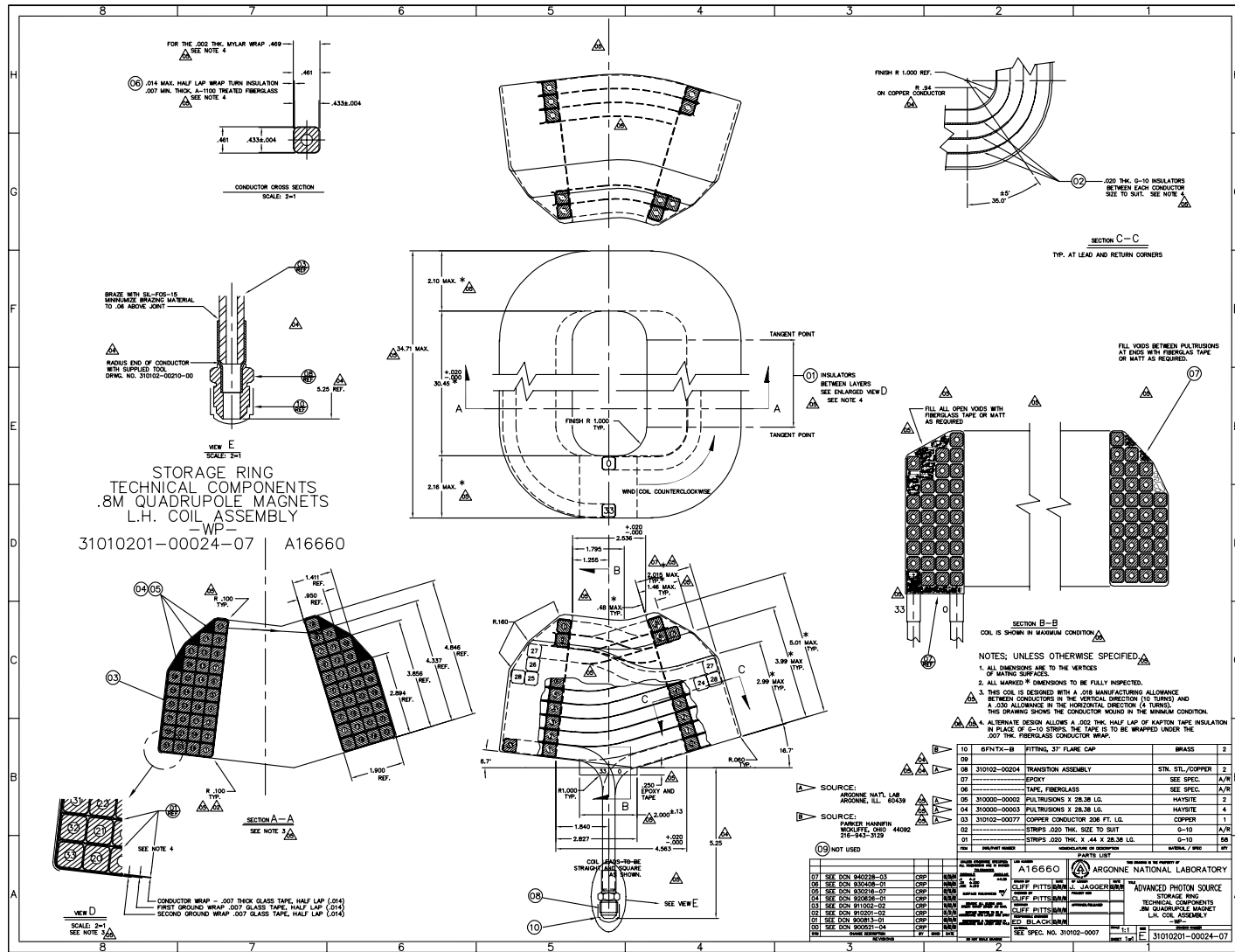


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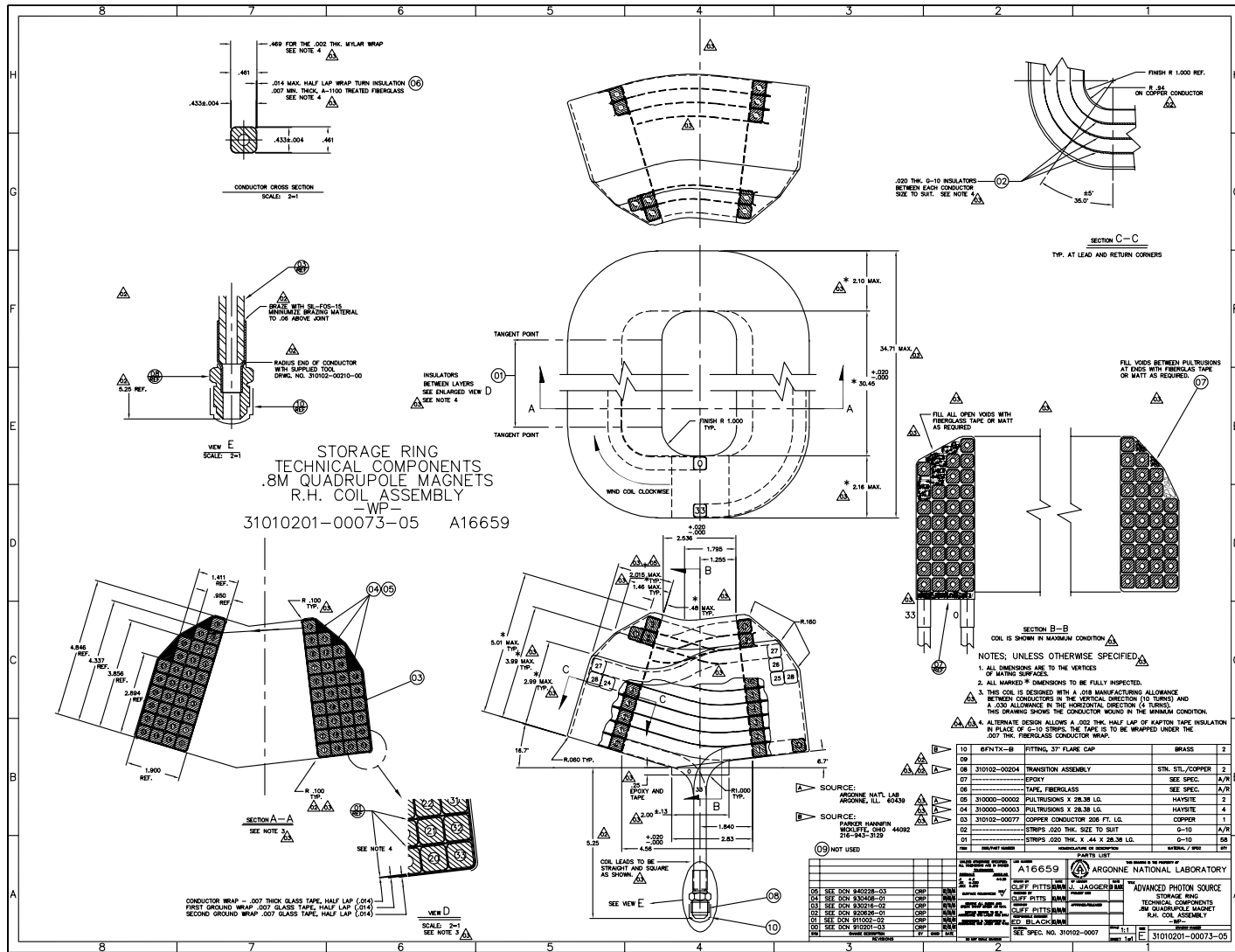


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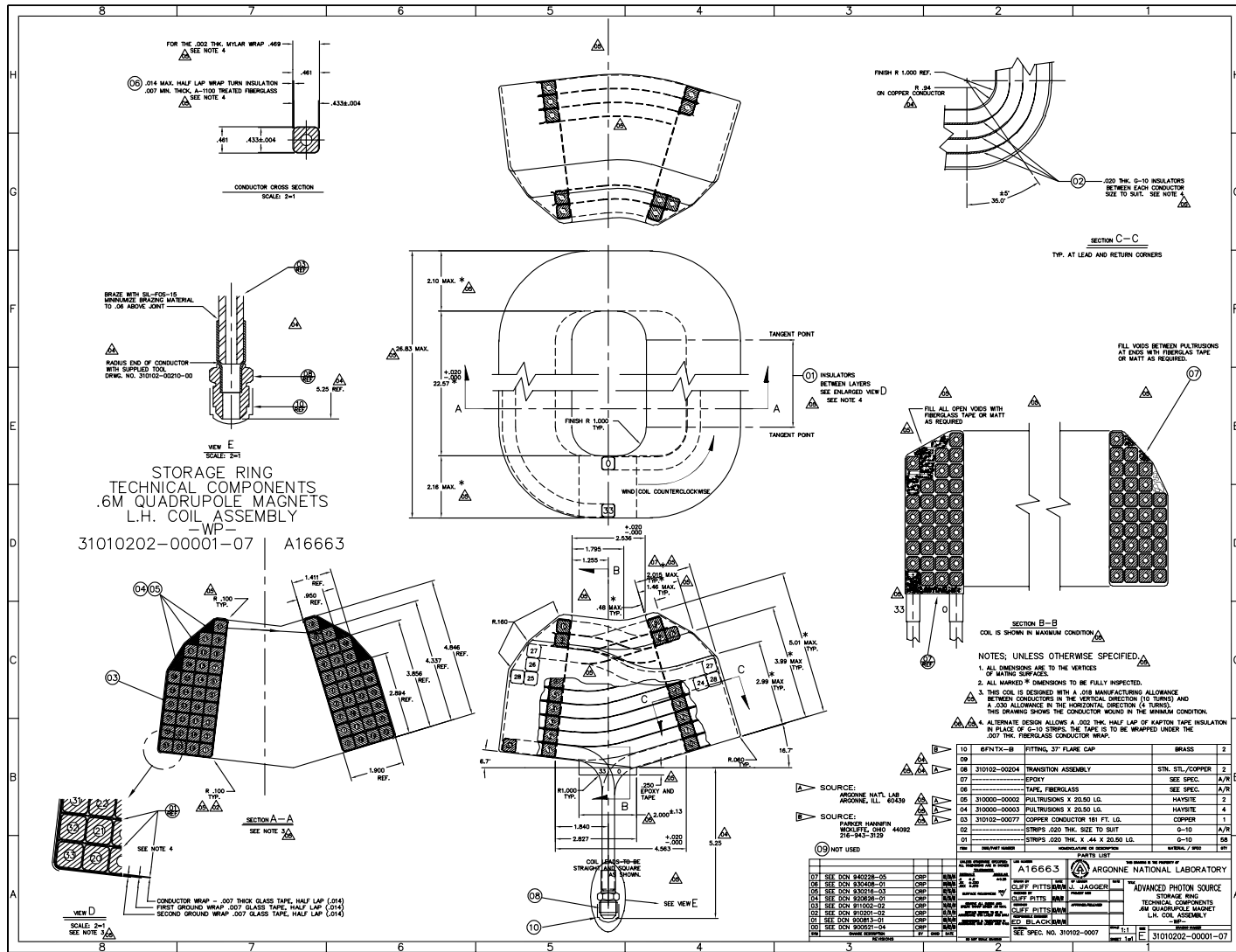
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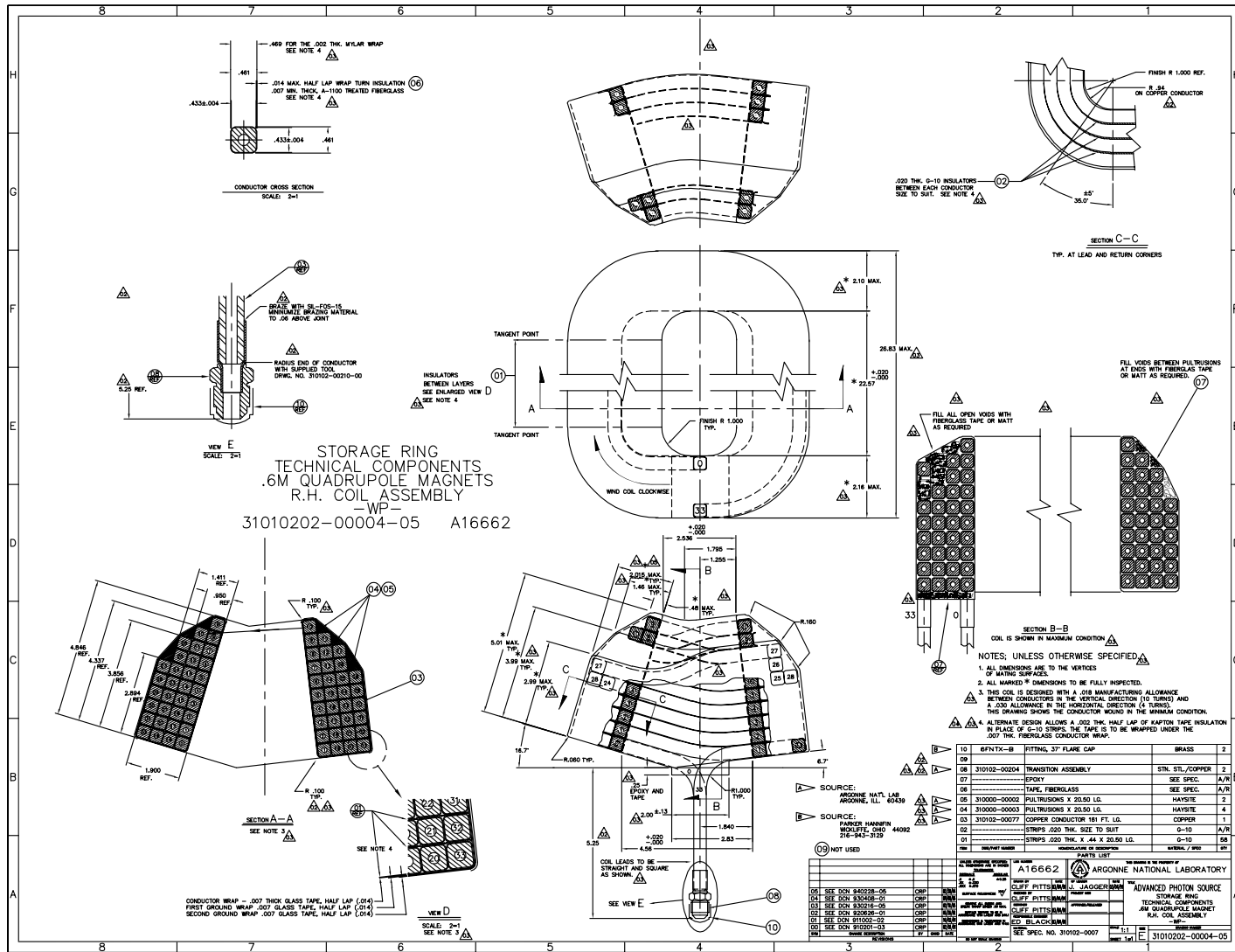


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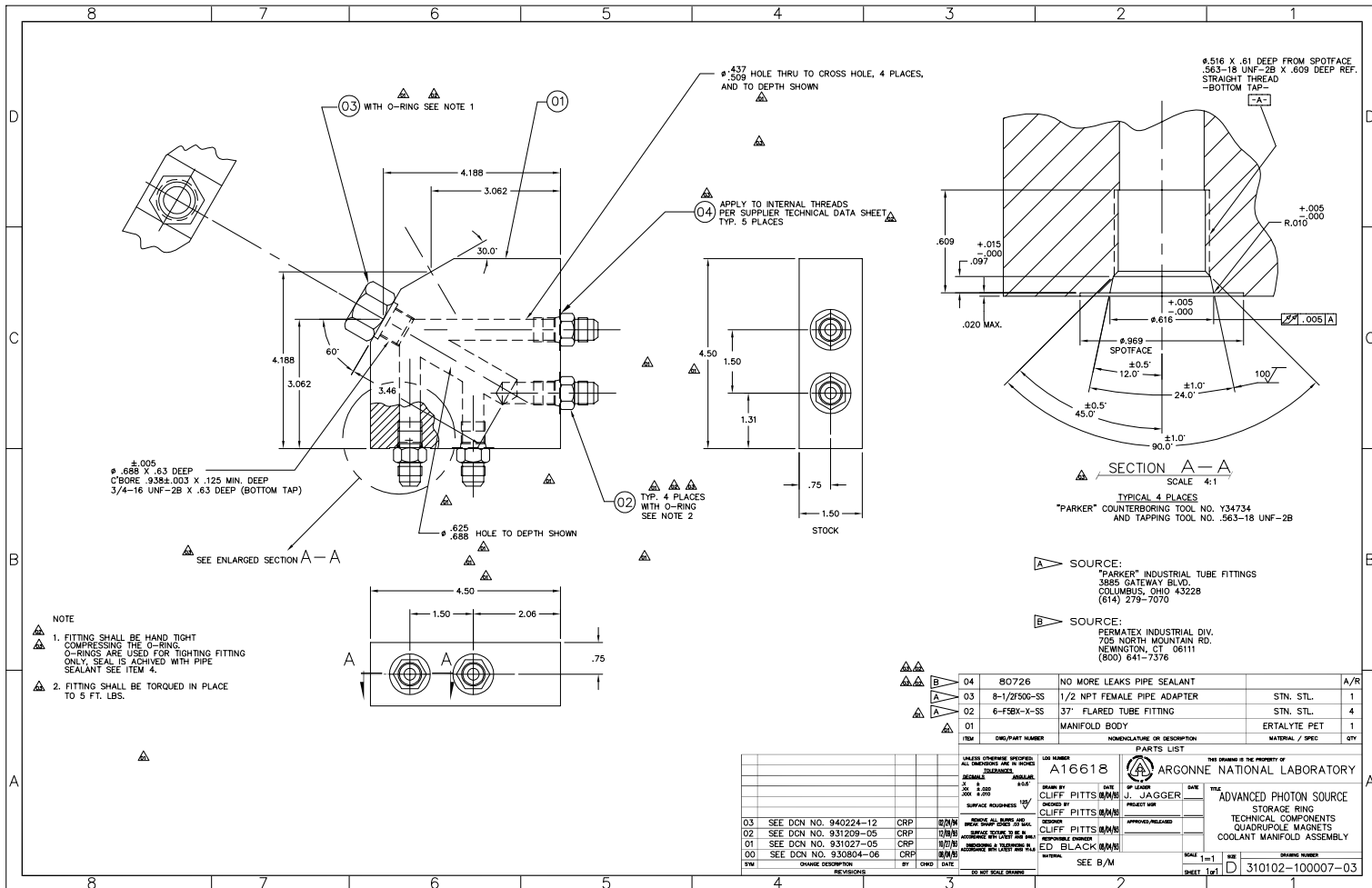


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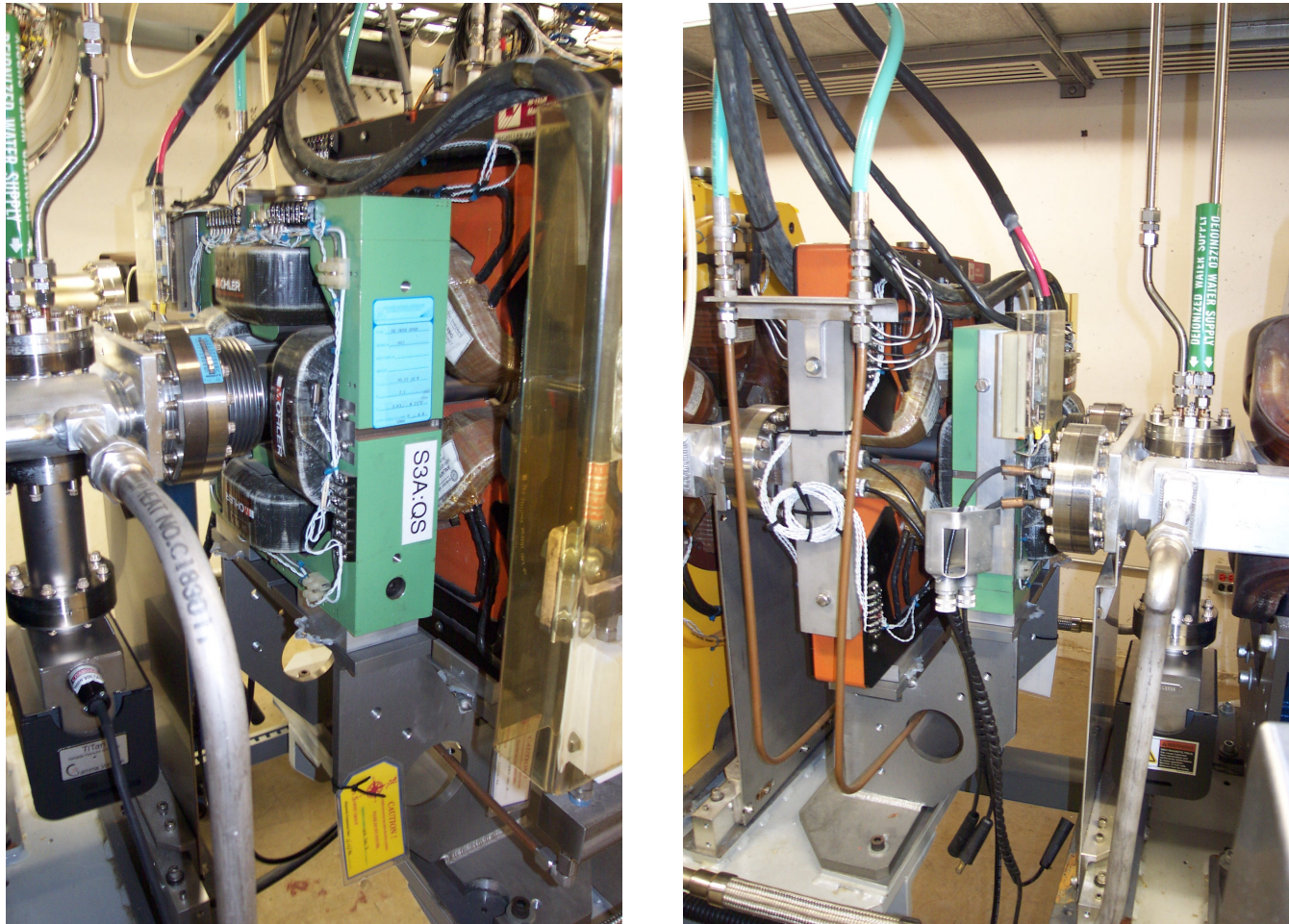


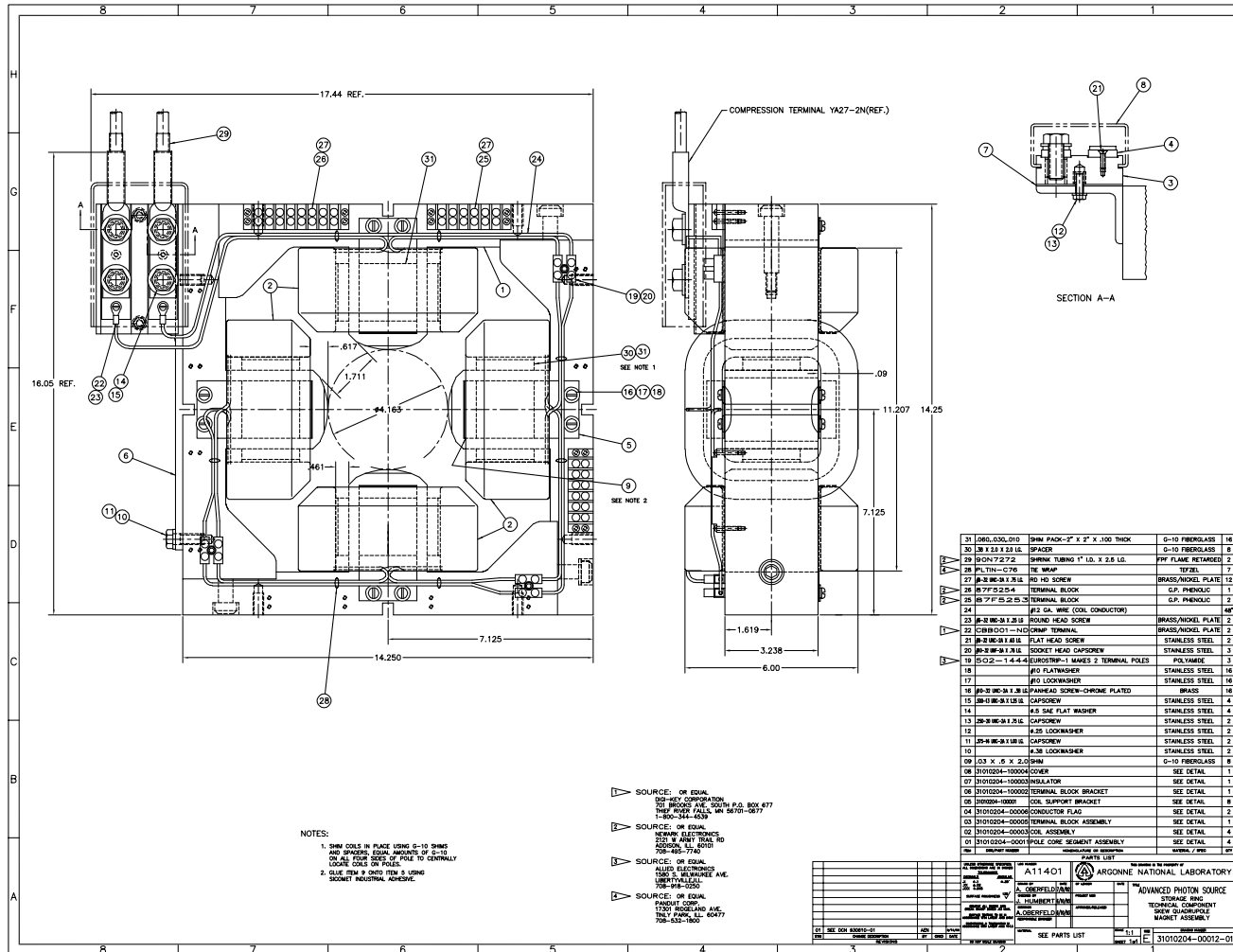
Figure 9: AQS (31010204-00012) Skew Quadrupole Magnet.

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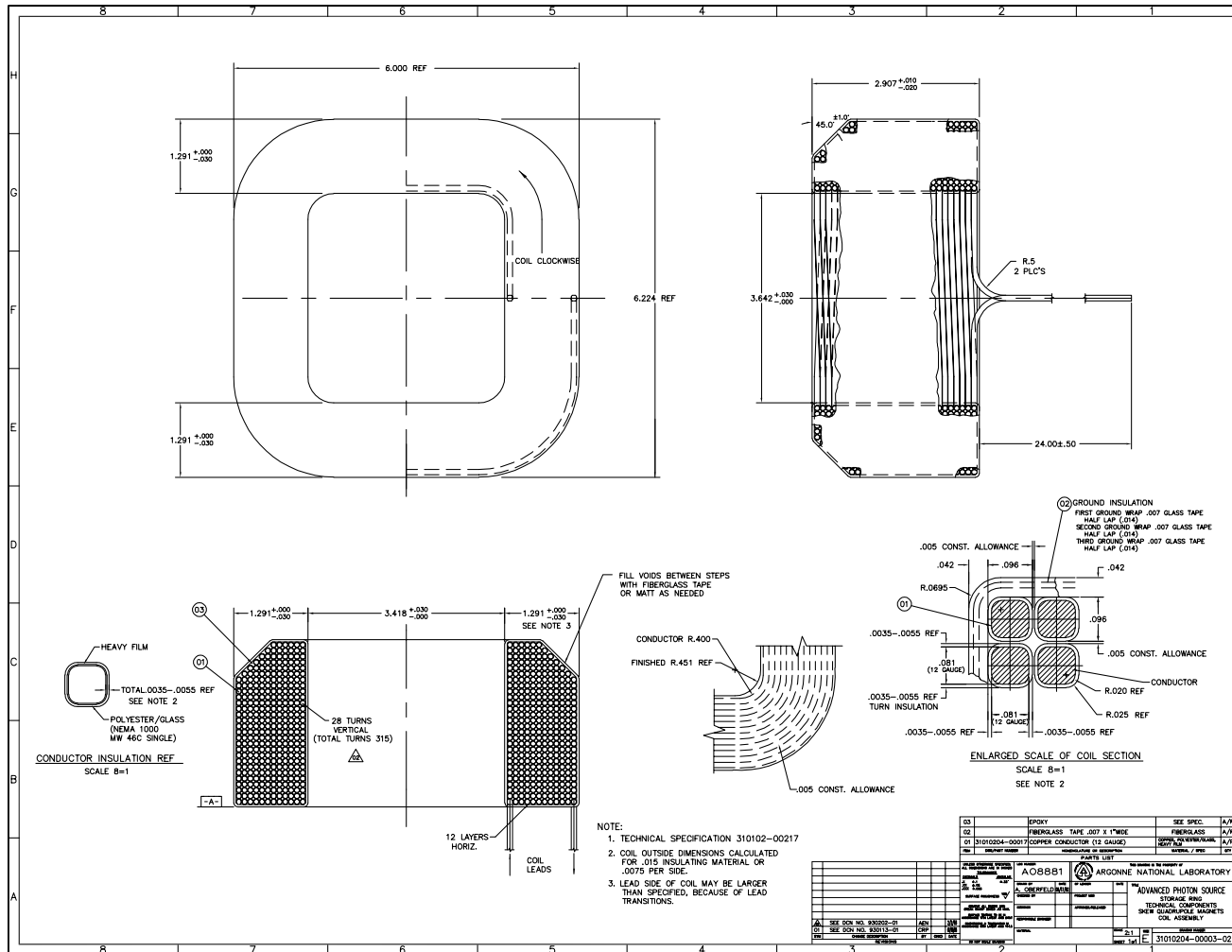


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