



Shielding Solutions



Who Is Nelco?

- Privately held
- Over 75 years in business
- Over 150 Full-time Employees
- 10-year Employees over 50%




- ★ Headquarters
- ★ Additional Fabrication Plants
- ★ Sales / Project Management Offices

NELCO Locations



Five Market Segments

- Industrial Radiation Shielding
- Anti-Corrosive Linings & Specialty Products
- Design and Construction
- Medical Radiation Therapy
- Medical Diagnostic Imaging



Professional Affiliations




Shielding Products Diagnostic

- Lead-lined Glass
- Lead-lined Acrylic
- Lead-lined Drywall
- Lead-lined Plywood
- Lead-lined Door Systems





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[Integrity | Innovation | Insight]

NCRP
National Council on Radiation Protection & Measurements


Report #147

Lead Discs — PGH 2.3.1.1 Sheet Lead

... for typical shielding applications, a lead sheet is glued to a sheet of gypsum wallboard and installed lead inward with nails or screws on wooden or metal studs. X-Ray images of wall segments show that insertion of the nails or screws does not result in significant radiation leaks. In fact, the steel nails or screws generally attenuate radiation equally, or more effectively, than the lead displaced by the nails. **Therefore, steel nails or screws used to secure lead barriers need not be covered with lead discs or supplementary lead.** However, where of two lead sheets meet, the continuity of shielding shall be ensured at the joints (SEC. 2.4.2)..."

Architect

75%



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Therapy Markets

Integrated Shielding Products

- High Density Concrete Block
- Interlocking Lead Brick
- Borated Polyethylene
- Megashield™



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High Density Concrete Block

LBS PER CU FT

145

240

288



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Interlocking Lead Brick



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5% Borated Polyethylene




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MegaShield™



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[Safety] [Innovation] [Reliability]

OFF SET Neutron Swinging Doors



48" clear Opening with door in it's open position

NELCO
[Safety] [Innovation] [Reliability]


Neutron Sliding Doors



Over 300 Doors Installed World Wide

NELCO
[Safety] [Innovation] [Reliability]

Compliance Standards

- OSHA 
- NCRP 
- Site-Specific Physics 
- Shop Drawings 
- Infection Control Guidelines 
- Quality Assurance Program 

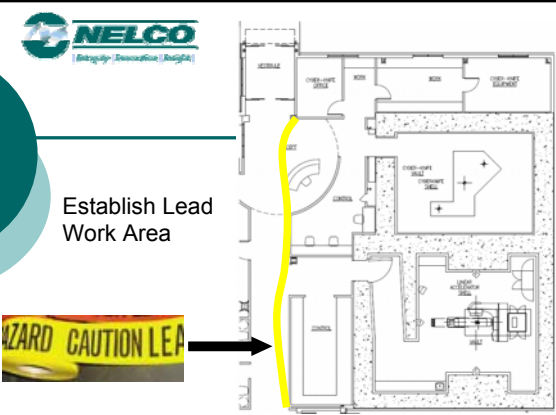
 Underwriters Laboratories Inc.
 ALARA
 osbpd  AAR

Lead Safety





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[Safety] [Innovation] [Reliability]


Establish Lead Work Area



NELCO
[Safety] [Innovation] [Reliability]

Air Sampling



Slide 18


sg2




I don't know if this is the correct machine or not - I picked it off the internet. If it matters, then tell me what machine we use, and I'll get an image of it


scott gleason, 4/4/2007

lead
82
Pb
207.2


OSHA Definitions




 0+	Normal Level < 30 µg/m ³ per 8-hour period
 30+	Action Level > 30 µg/m ³ per 8-hour period
 50	Permissible Exposure Limit 50 µg/m ³ per 8-hour period



Establish Lead Work Area
Air Sampling
Blood Tests



 30+



**TYPICAL
PROJECT TEAM**




Project Team



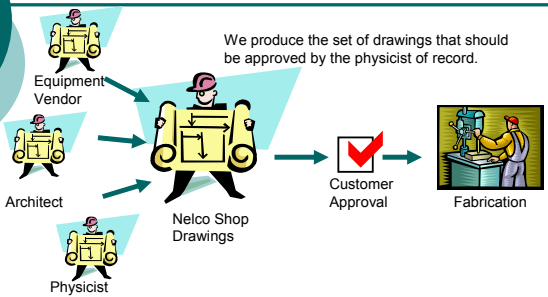
NELCO'S TYPICAL SCOPE

1. DEVELOP SHOP DRAWINGS
2. Have them approved by Architect
3. Start Product Fabrication



Shop Drawing Process

We produce the set of drawings that should be approved by the physicist of record.



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    graph LR
      EV[Equipment Vendor] --> NSD[Nelco Shop Drawings]
      A[Architect] --> NSD
      P[Physicist] --> NSD
      NSD --> CA[Customer Approval]
      CA --> F[Fabrication]
  
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Shielding Challenges

Cost Effective Shielding

– **WHEN SPACE IS NOT AN ISSUE**

– Most cost effective shielding is 147 pound per cubic foot concrete.

- CIP- Cast in Place
- Modular Precast Concrete



Cost Effective Shielding

– **WHEN SPACE IS AN ISSUE**

- NELCO philosophy for shielding complex projects is based upon available space.
- We offer shielding solutions to meet the physics needs with a variety of material starting with concrete, HD Concrete MU, Precast Concrete, Steel Plate, Lead, Pure Poly, and Borated poly.

OOPS

- Items most often left out of a physics design

HVAC – SHIELDING

- Supply and Return air ducts are often times 24" tall and 60" wide.

- Physics port! Hard to install after the fact!

NEUTRON SHIELDING CALCULATIONS

- Neutron Shielding! Many physicist often overlook this calculation on a 10MV Accelerator

HVAC SHIELDING




HVAC SHIELDING CAN RUN UPWARDS OF 20,000 DOLLARS



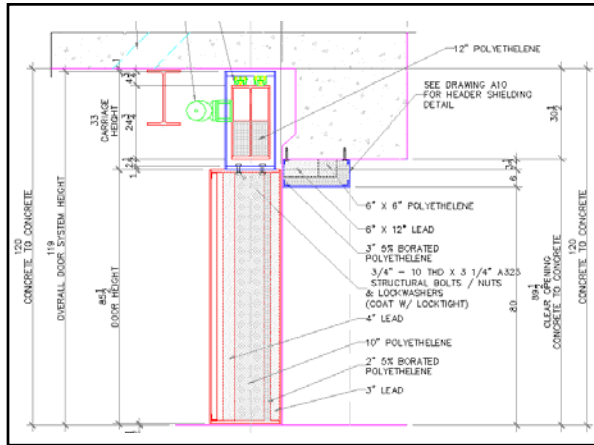
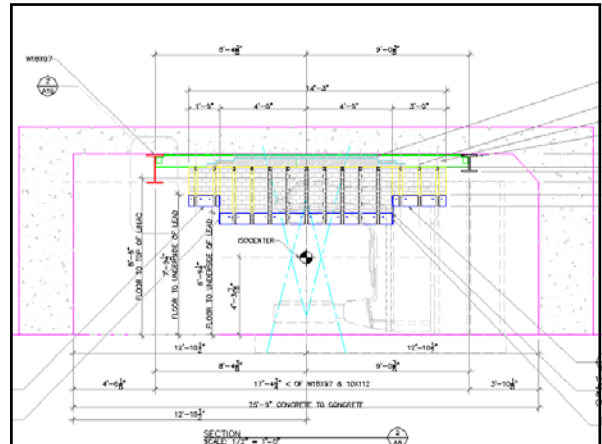
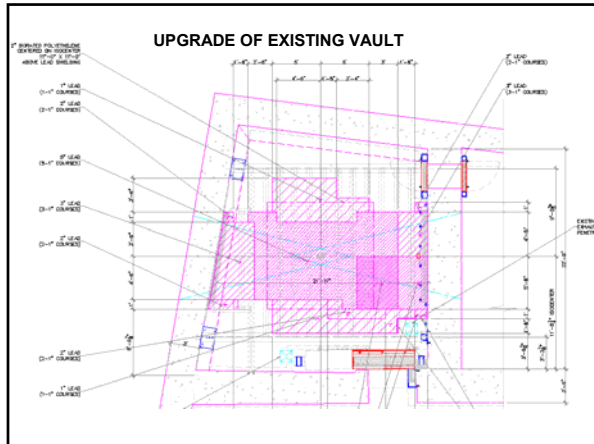
Interlocking Lead Brick





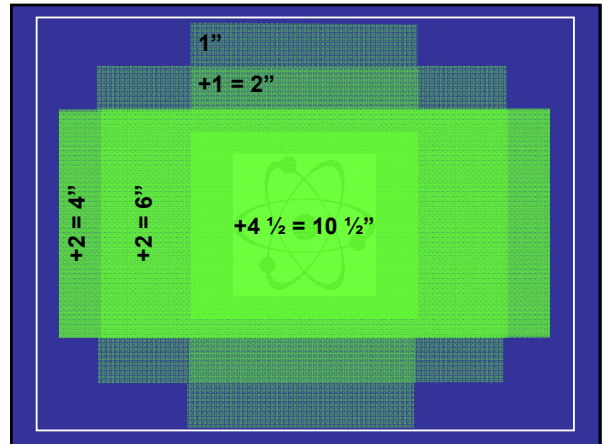
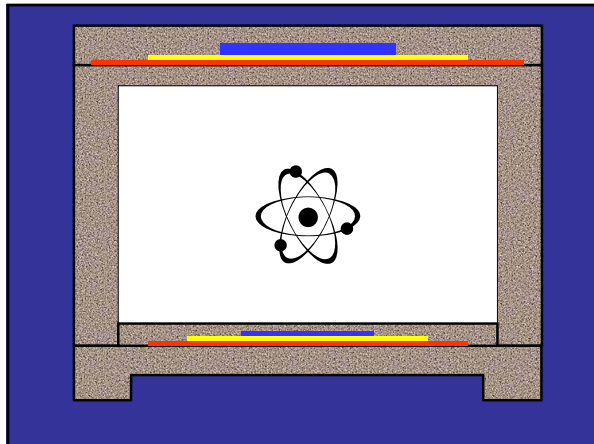
LEAD BRICK WALL SHIELDING










Precision Shielding?

Material	Thickness (in)	Weight (lb)	Weight (kg)	Weight (lb)	Weight (kg)
1/2" Lead	0.5	16.0	7.3	16.0	7.3
1" Lead	1.0	32.0	14.5	32.0	14.5
2" Lead	2.0	64.0	29.0	64.0	29.0
3" Lead	3.0	96.0	43.5	96.0	43.5
4" Lead	4.0	128.0	58.0	128.0	58.0
5" Lead	5.0	160.0	72.5	160.0	72.5
6" Lead	6.0	192.0	87.0	192.0	87.0
7" Lead	7.0	224.0	101.5	224.0	101.5
8" Lead	8.0	256.0	116.0	256.0	116.0
9" Lead	9.0	288.0	130.5	288.0	130.5
10" Lead	10.0	320.0	145.0	320.0	145.0
11" Lead	11.0	352.0	159.5	352.0	159.5
12" Lead	12.0	384.0	174.0	384.0	174.0
13" Lead	13.0	416.0	188.5	416.0	188.5
14" Lead	14.0	448.0	203.0	448.0	203.0
15" Lead	15.0	480.0	217.5	480.0	217.5
16" Lead	16.0	512.0	232.0	512.0	232.0
17" Lead	17.0	544.0	246.5	544.0	246.5
18" Lead	18.0	576.0	261.0	576.0	261.0
19" Lead	19.0	608.0	275.5	608.0	275.5
20" Lead	20.0	640.0	290.0	640.0	290.0
21" Lead	21.0	672.0	304.5	672.0	304.5
22" Lead	22.0	704.0	319.0	704.0	319.0
23" Lead	23.0	736.0	333.5	736.0	333.5
24" Lead	24.0	768.0	348.0	768.0	348.0
25" Lead	25.0	800.0	362.5	800.0	362.5
26" Lead	26.0	832.0	377.0	832.0	377.0
27" Lead	27.0	864.0	391.5	864.0	391.5
28" Lead	28.0	896.0	406.0	896.0	406.0
29" Lead	29.0	928.0	420.5	928.0	420.5
30" Lead	30.0	960.0	435.0	960.0	435.0
31" Lead	31.0	992.0	449.5	992.0	449.5
32" Lead	32.0	1024.0	464.0	1024.0	464.0
33" Lead	33.0	1056.0	478.5	1056.0	478.5
34" Lead	34.0	1088.0	493.0	1088.0	493.0
35" Lead	35.0	1120.0	507.5	1120.0	507.5
36" Lead	36.0	1152.0	522.0	1152.0	522.0
37" Lead	37.0	1184.0	536.5	1184.0	536.5
38" Lead	38.0	1216.0	551.0	1216.0	551.0
39" Lead	39.0	1248.0	565.5	1248.0	565.5
40" Lead	40.0	1280.0	580.0	1280.0	580.0
41" Lead	41.0	1312.0	594.5	1312.0	594.5
42" Lead	42.0	1344.0	609.0	1344.0	609.0
43" Lead	43.0	1376.0	623.5	1376.0	623.5
44" Lead	44.0	1408.0	638.0	1408.0	638.0
45" Lead	45.0	1440.0	652.5	1440.0	652.5
46" Lead	46.0	1472.0	667.0	1472.0	667.0
47" Lead	47.0	1504.0	681.5	1504.0	681.5
48" Lead	48.0	1536.0	696.0	1536.0	696.0
49" Lead	49.0	1568.0	710.5	1568.0	710.5
50" Lead	50.0	1600.0	725.0	1600.0	725.0
51" Lead	51.0	1632.0	739.5	1632.0	739.5
52" Lead	52.0	1664.0	754.0	1664.0	754.0
53" Lead	53.0	1696.0	768.5	1696.0	768.5
54" Lead	54.0	1728.0	783.0	1728.0	783.0
55" Lead	55.0	1760.0	797.5	1760.0	797.5
56" Lead	56.0	1792.0	812.0	1792.0	812.0
57" Lead	57.0	1824.0	826.5	1824.0	826.5
58" Lead	58.0	1856.0	841.0	1856.0	841.0
59" Lead	59.0	1888.0	855.5	1888.0	855.5
60" Lead	60.0	1920.0	870.0	1920.0	870.0
61" Lead	61.0	1952.0	884.5	1952.0	884.5
62" Lead	62.0	1984.0	899.0	1984.0	899.0
63" Lead	63.0	2016.0	913.5	2016.0	913.5
64" Lead	64.0	2048.0	928.0	2048.0	928.0
65" Lead	65.0	2080.0	942.5	2080.0	942.5
66" Lead	66.0	2112.0	957.0	2112.0	957.0
67" Lead	67.0	2144.0	971.5	2144.0	971.5
68" Lead	68.0	2176.0	986.0	2176.0	986.0
69" Lead	69.0	2208.0	1000.5	2208.0	1000.5
70" Lead	70.0	2240.0	1015.0	2240.0	1015.0
71" Lead	71.0	2272.0	1029.5	2272.0	1029.5
72" Lead	72.0	2304.0	1044.0	2304.0	1044.0
73" Lead	73.0	2336.0	1058.5	2336.0	1058.5
74" Lead	74.0	2368.0	1073.0	2368.0	1073.0
75" Lead	75.0	2400.0	1087.5	2400.0	1087.5
76" Lead	76.0	2432.0	1102.0	2432.0	1102.0
77" Lead	77.0	2464.0	1116.5	2464.0	1116.5
78" Lead	78.0	2496.0	1131.0	2496.0	1131.0
79" Lead	79.0	2528.0	1145.5	2528.0	1145.5
80" Lead	80.0	2560.0	1160.0	2560.0	1160.0
81" Lead	81.0	2592.0	1174.5	2592.0	1174.5
82" Lead	82.0	2624.0	1189.0	2624.0	1189.0
83" Lead	83.0	2656.0	1203.5	2656.0	1203.5
84" Lead	84.0	2688.0	1218.0	2688.0	1218.0
85" Lead	85.0	2720.0	1232.5	2720.0	1232.5
86" Lead	86.0	2752.0	1247.0	2752.0	1247.0
87" Lead	87.0	2784.0	1261.5	2784.0	1261.5
88" Lead	88.0	2816.0	1276.0	2816.0	1276.0
89" Lead	89.0	2848.0	1290.5	2848.0	1290.5
90" Lead	90.0	2880.0	1305.0	2880.0	1305.0
91" Lead	91.0	2912.0	1319.5	2912.0	1319.5
92" Lead	92.0	2944.0	1334.0	2944.0	1334.0
93" Lead	93.0	2976.0	1348.5	2976.0	1348.5
94" Lead	94.0	3008.0	1363.0	3008.0	1363.0
95" Lead	95.0	3040.0	1377.5	3040.0	1377.5
96" Lead	96.0	3072.0	1392.0	3072.0	1392.0
97" Lead	97.0	3104.0	1406.5	3104.0	1406.5
98" Lead	98.0	3136.0	1421.0	3136.0	1421.0
99" Lead	99.0	3168.0	1435.5	3168.0	1435.5
100" Lead	100.0	3200.0	1450.0	3200.0	1450.0

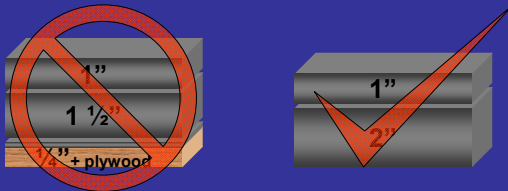


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[Technology | Innovation | Integrity]

Standard Thicknesses

North Wall Primary	$3 \frac{13}{16}'' = 4''$	
North Wall Secondary	$2 \frac{1}{4}'' = 2 \frac{1}{2}''$	
South Wall Primary	$3 \frac{3}{8}'' = 3 \frac{1}{2}''$	
South Wall Secondary	$2 \frac{3}{4}'' = 3''$	
East & West Walls	$\frac{3}{4}'' = 1''$	


2 3/4''



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Nelco for Physicists

- Fit and Feasibility
- Shielding Solutions
 - Various material options
- Budgetary Input



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Nelco for Physicists

- Standard Product Details
- Historical Data
- Design Consulting
- Engineering Support
- Referrals



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Questions?



1-800-NELCO13

For More Information...



WWW.NELCO-USA.COM