THE TRITIUM GUY

- Presented by:
- Joe Klinger, Chief
- Division of Radioactive Materials
- IL Dept. of Nuclear Safety

Generally Licensed Exit Signs

- Safe and Important: Fires, electrical blackouts
- Inexpensive, very little maintenance
- Ubiquitous (12,000 + IL)/350,000 in NRC jurisdictions
- Mfrd/dist. under sp. lic. and used under general license (gl)

Exit Signs

Glass Tubes: Gaseous Tritium

Pure Beta Emitter, 18.6 KeV
T 1/2=12.3 Yrs/Bio.T 1/2=10 days

Phosphor=ZnS on tube walls
Glows due to Beta interactions w/phosphor





Problems

- Multi-Curie quantities of Hydrogen-3
- GLs not required to license or register
- Not aware of ram
- Not aware that they are regulated
- Not aware of proper disposal
- Inadequate labeling

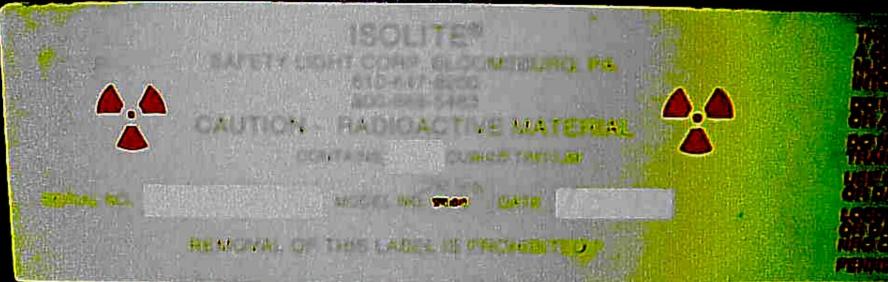


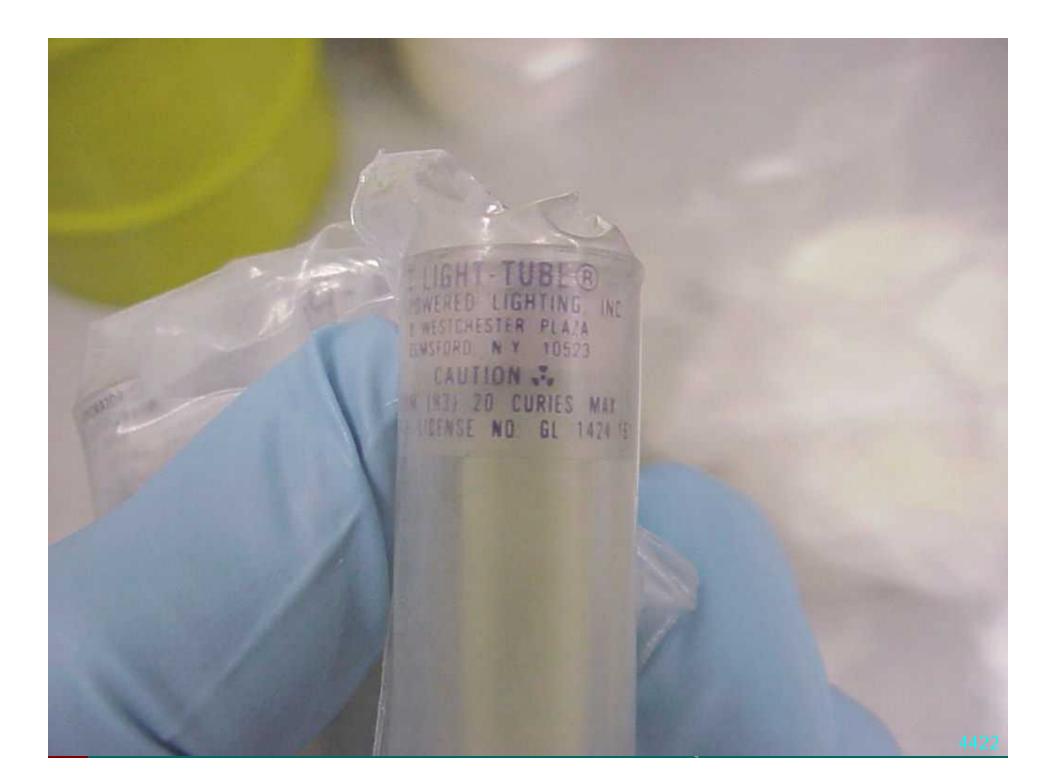
SELF-LUMINOUS EXIT SIGN (MARKER) RECOMMENDED MAXIMUM DISTANCE FOR LEGIBILITY: 100 FT. RECOMMENDED EFFECTIVE LIFE: 10 YEARS REPLACE BEFORE: 12/2005

incontra

THIS DE WITH LETTER (0.21 Cd/Sc THAN 5 FT C SEE UL MEC

and the state of the set of the





Problems (cont.)

 Safe and effective unless you have the inquisitive, intelligent(?!) and most dreaded of all:

THE TRITIUM GUY

NJ Tritium Guys

 1st-teen found an exit sign - swim suit posters, sunflower seeds – Fire Dept., GM Tube. No **Contamination!** - NJDEP investigated -23 Agencies, \$100,000 +, TEDE 80 mrem (256)

NJ (cont.)

- 2nd- Teen- Child Trtmt Center
 Tantrum
 - 15 Curies, several tubes broken
 - 930,000 dpm/100cm2 in bedroom/16 mrem
 - \$200,000 + 16 mrem

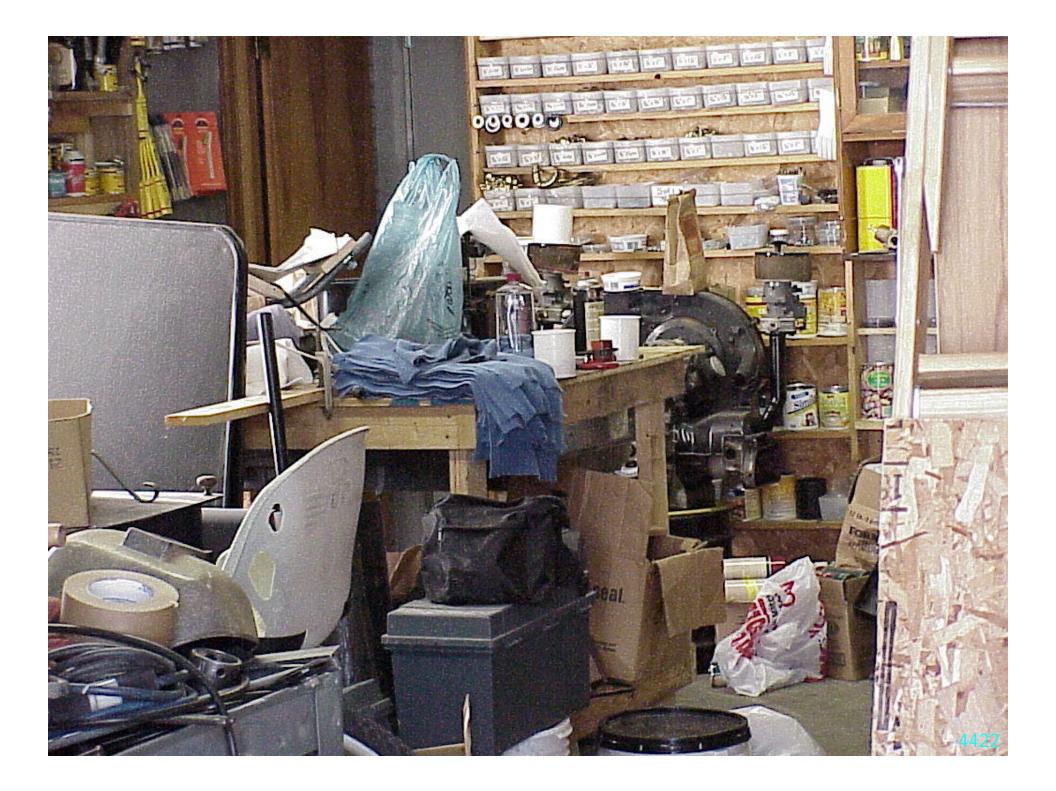
IL Tritium Experience

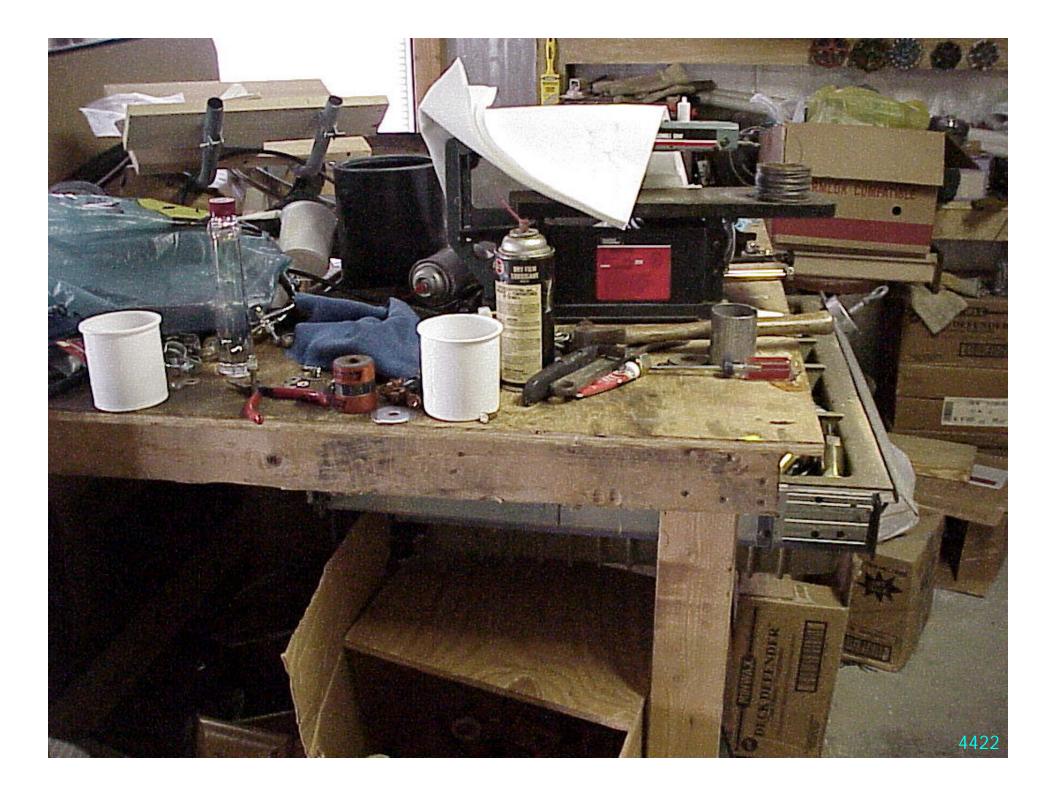
- Nov 1, 1999--MINWAX in Flora, IL
- Damaged sign (Self-powered Lighting, Elmsford, NY)
- Scavenger-(aka Tritium Guy)
- Home

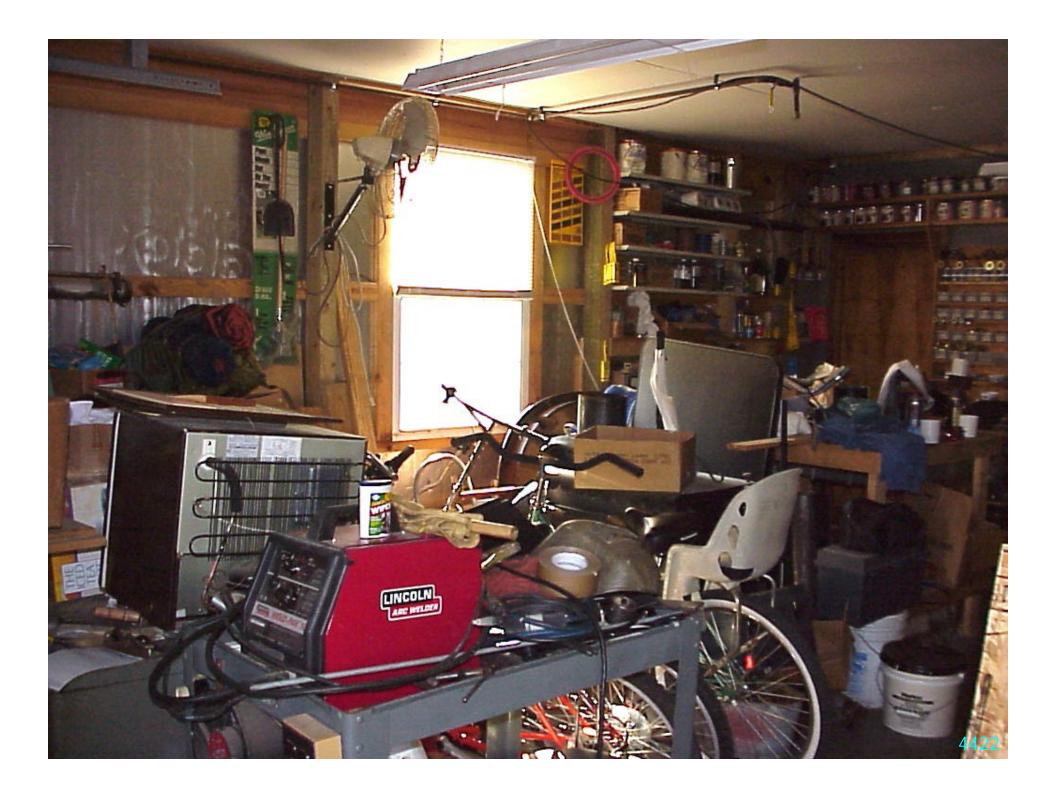












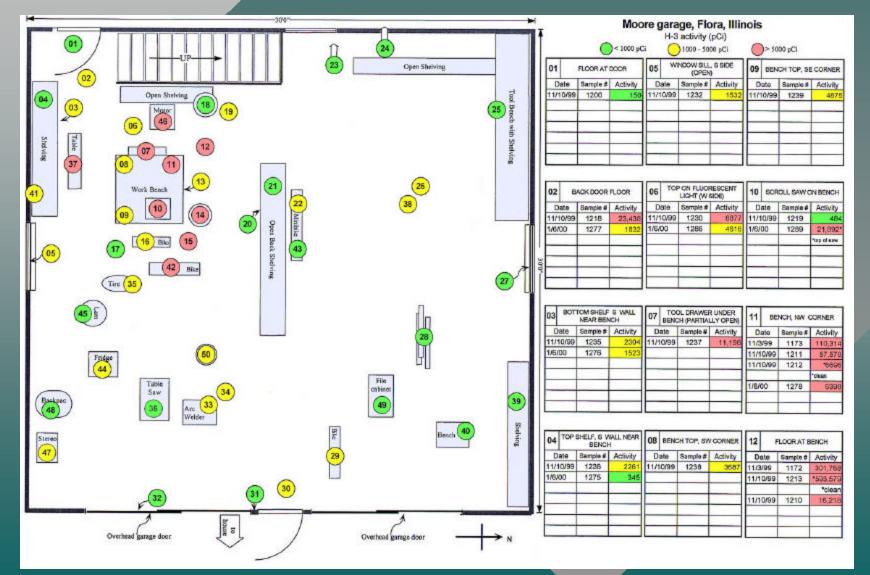
Contamination Assessment

- Wipe samples only effective means of measurement
- IDNS Lab in Springfield. Liquid Scintillation (Phosphor interference)
- Urinalyses
- Portable Proportional Gas Flow Proportional Counter

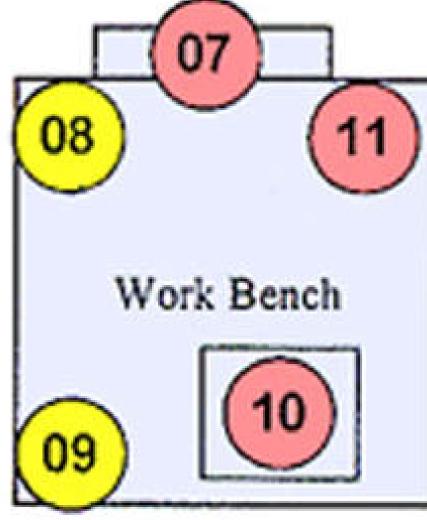
Contamination Limits

- 340 Appendix A (Similar to NRC RG 1.86)
 - -1,000 pCi/100 cm2
 - 5,000 pCi/100 cm2 Max.
 - Fixed--250 microrem/hr @ 1 cm

Before Decon







Before Decon

11	BENCH, NW CORNER					
Date		Sample #	Activity			
11/3/99		1173	110,314			
11/10/99		1211	57,578			
11/10/99		1212	*6696			
			*clean			
1/6/00		1278	6398			

IDNS Decontamination Decision

- Luxury of contamination confined to a non-residence
- Luxury of time for H-3 concentration reduction over time
- Most of the source was initially removed. Contamination was like a particulate

IDNS Decontamination Decision (cont.)

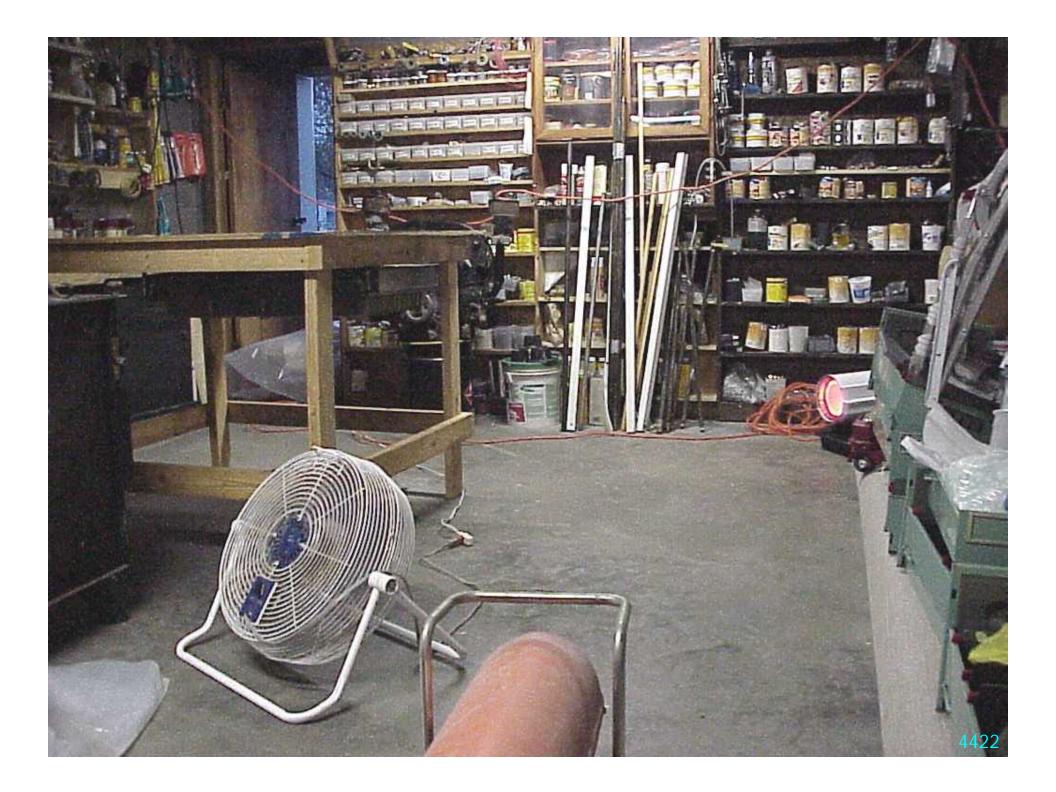
- Equipment, supplies, manpower to conduct ourselves and save expense
- Opportunity for staff for practical health physics experience

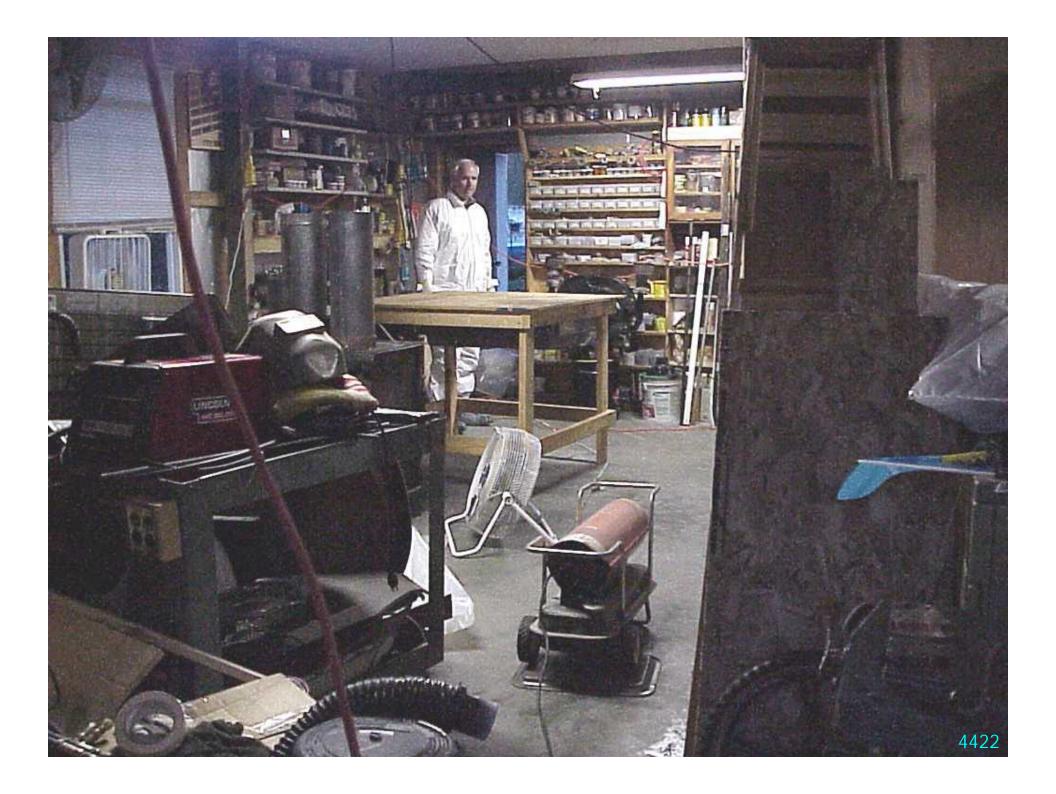
Decon Methods

- Basic HP contamination control
- Rotated duties
- Non-phosphate detergent and water (detector interference)
- Iso-propyl alcohol
- Washed down and air-dried.
 Ventilation and heating, collander for small items



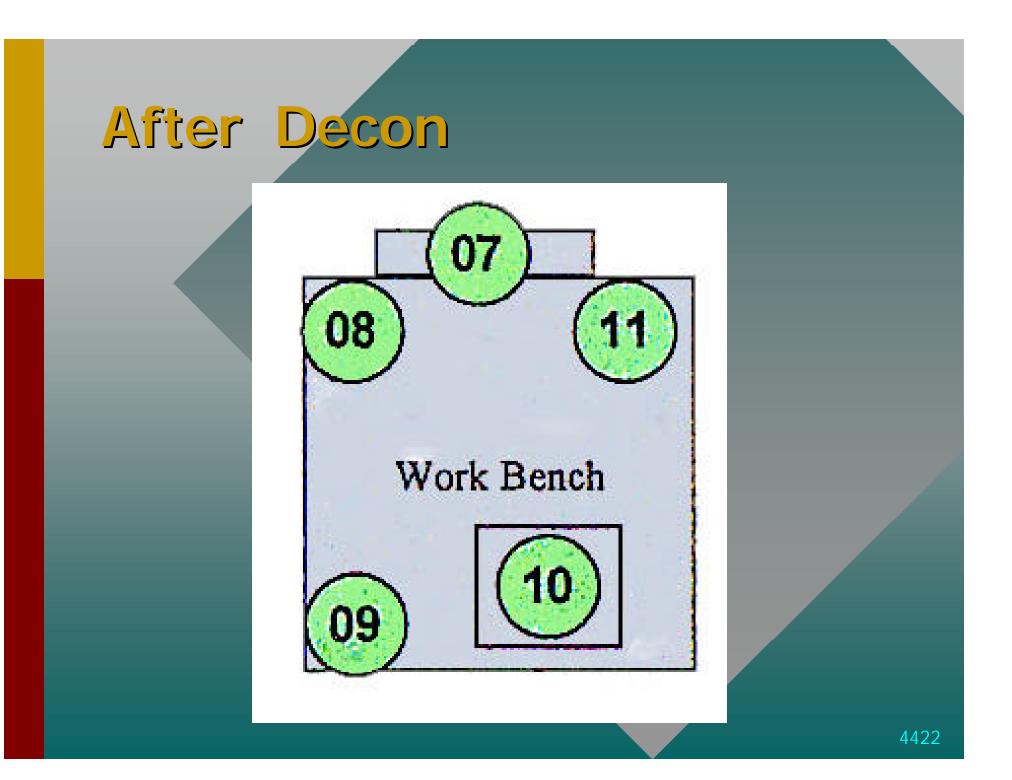






After Decc..

		and the second second	Moc	re garage, Flora, Illi	nois
01	1 (24)		-	H-3 activity (pCI)	
66 UP +	23 Open Shelving		< 1000 pC	i 🚫 1000 - 5000 pCi	○ > 5000 pCi
	Open snetving			(Revision 1, 4/21/00)	
04 c9 03 53 c4 18	cleaned items placed here	Tool Bench with Shelving	01 FLOOR AT DOOR	05 WINDOW SILL, S SIDE (OPEN)	09 BENCH TOP, SE CORNER
46 59 60	IV (71 (18) m) (78)	ach	Date Sample # Activity	Date Sample # Activity	Date Sample# Activity
	(69) (72) 10 Bake	with	11/10/99 1200 150	11/10/99 1232 1532	
Table 12	15 73	Shel			4/3/00 1334 5
37 08 (11)		ving			
Work Bench	(21) (26)				
	22 (38)		02 BACK DOOR FLOOR	06 TOP ON FLUORESCENT	10 SCROLL SAW ON BENCH
62 00 (10) (14)				LIGHT (W SIDE)	
	Minitike (3)		Date Sample # Activity 11/10/99 1218 23,438	Date Sample # Activity 11/10/99 1230 8877	Date Sample# Activity 11/10/99 1219 484
	in Ba		1/6/00 1277 1832	1/6/00 1285 4616	The second
05 (17) (51)			4/3/00 1335 64	4/3/00 1342 113	
	Initiate (3)	×	30'0		4/3/00 1310 25
Tire (35)	20	27			
					,
	0		03 BOTTOM SHELF S WALL NEAR BENCH	07 TOOL DRAWER UNDER BENCH (PARTIALLY OPEN)	11 BENCH, NW CORNER
(45) fm			Date Sample # Activity	Date Sample # Activity	Date Sample# Activity
Ŭ	(28)		11/10/99 1235 2304	11/10/99 1237 11,198	11/3/99 1173 110,314
_Desk			1/6/00 1276 1523	4/3/00 1330 5	
Fridge 65 50	Υ				11/10/99 1212 *6696 *clean
(44)					1/6/00 1278 6398
Table	File cabinet				4/3/00 1331 32
Backpac Saw 34		39			4/3/00 1332 34
(48) 36 Arc 33 Welder	(49)	\sim			
The second secon	E Rench (40)	She	04 TOP SHELF, S WALL NEAR BENCH	08 BENCH TOP, SW CORNER	12 FLOOR AT BENCH
Stereo	Bench 40	Shelving	Date Sample # Activity	Date Sample # Activity	Date Sample # Activity
47	(29)	~	11/10/99 1236 2261	11/10/99 1238 3687	11/3/99 1172 301,768
			1/6/00 1275 345	4/3/00 1333 135	
944					*clean
(32) (31	30				11/10/99 1210 16,218 4/3/00 1336 60
F (32) (31)					4/3/00 1330 00
					· I ··································
Overhead garage door	Overhead garage door				
Overliede Barage unor	Cremeso galage door	→ N			



After Decon

BENCH, NW CORNER					
ate	Sample #	Activity			
3/99	1173	110,314			
0/99	1211	57,578			
0/99	1212	*6696			
		*clean			
00	1278	6398			
00	1331	32			
00	1332	34			
	ate 3/99 0/99 0/99 0/99 00	ateSample #3/9911730/9912110/991212001278001331			

Final Dose Estimates

 Tritium Guy--7.1 mrem (DOE REMedy and ANSI HPS N13.14-1994)

Final Dose Estimates (cont.)

- 250+ (NCRP 65)
 - REMedy-SAIC, integrates ICRP 30 biokinetcs models, TEDE based on avg <urine> 24 hr. periods.

– Tritium Spouse--1.07 mrem/Tritium Daughter--1.06 mrem

– Highest IDNS --.18 mrem

Final Cost Estimates

- Staff Time including decon, ntgs., travel = \$31, 735
- Bioassay analyses = \$11,700
- Wipe Sample analyses = \$16,650
- Disposal of 4 drums of waste = \$4,000
- TOTAL = \$64,085.00

Final Recommendations

- Labeling improvements
- Sales literature improvements (install and forget about for 20 years!). Enhanced communication with contractors, vendors, building owners etc.

Final Recommendations (cont.)

- Discourage proliferation simply to avoid running electrical wire.
- Install protection to avoid damage.

Final Recommendations (cont.)

- Revisit Acceptable Surface
 Contamination Levels in NRC RG
 1.86 and related documents
- Possible technological improvements to solidify or mix phosphor with H-3 to improve detection and decon efforts
- Watch out for "Tritium Guys" in your neighborhood!