**US Environmental Protection Agency
Office of Pesticide Programs**

**Occupational Pesticide Handler Unit
Exposure Surrogate Reference Table**

**May 2021**

| USEPA / Office of Pesticide Programs / Health Effects Division Occupational Pesticide Handler Unit Exposure Surrogate Reference Table | | | | | | |
|---|---|---|---|---|---|---|
| Exposure Scenario (Activity, Equipment, Formulation, Site, etc.)[1] | Exposure Route | Personal Protective Equipment (PPE) Level[2] | | Data Source[3,4,5] | Statistic | Unit Exposure (µg/lb ai) |
| Mixing / Loading Dry Flowable | Dermal | Single layer, no gloves (A) | | AHETF (MEA) | Mean | 227 |
| | | Single layer, gloves | | AHETF (MEA) | Mean | 51.6 |
| | | Double layer, gloves (B) | | AHETF (MEA) | Mean | 41.2 |
| | | Engineering control (water-soluble packaging) | No gloves (A) | AHETF (MEA) | Mean | 64 |
| | | | Gloves | AHETF (MEA) | Mean | 12.5 |
| | Inhalation | No Respirator | | AHETF | Mean | 8.96 |
| | | PF10 (C) | | AHETF | Mean | 0.896 |
| | | PF50 (D) | | AHETF | Mean | 0.179 |
| | | Engineering control (water-soluble packaging) | No Respirator | AHETF | Mean | 2.6 |
| | | | PF10 (C) | AHETF | Mean | 0.26 |
| Mixing / Loading Granules | Dermal | Single layer, no gloves (A) | | AHETF (MEA) | Mean | 23.6 |
| | | Single layer, gloves | | AHETF (MEA) | Mean | 8.12 |
| | | Double layer, gloves (B) | | AHETF (MEA) | Mean | 5.80 |
| | | Engineering control (closed loading system) | No gloves (A) | AHETF | Mean | 0.233 |
| | | | Gloves | AHETF | Mean | 0.136 |
| | Inhalation | No Respirator | | AHETF | Mean | 0.825 |
| | | PF10 (C) | | AHETF | Mean | 0.083 |
| | | PF50 (D) | | AHETF | Mean | 0.017 |
| | | Engineering control (closed loading system) | No respirator | AHETF | Mean | 0.011 |
| | | | PF10 (C) | AHETF | Mean | 0.0011 |
| Mixing / Loading Liquids | Dermal | Single layer, no gloves (A) | | AHETF (MEA) | Mean | 220 |
| | | Single layer, gloves | | AHETF (MEA) | Mean | 37.6 |
| | | Double layer, gloves (B) | | AHETF (MEA) | Mean | 29.1 |

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|---|---|---|---|---|---|---|
| **Exposure Scenario (Activity, Equipment, Formulation, Site, etc.)[1]** | **Exposure Route** | **Personal Protective Equipment (PPE) Level[2]** | | **Data Source[3,4,5]** | **Statistic** | **Unit Exposure (µg/lb ai)** |
| | | Engineering control (closed loading system) | No gloves (A) | AHETF (MEA, *f*RA) | Mean | 30.4 |
| | | | Gloves | AHETF (MEA, *f*RA) | Mean | 4.02 |
| | Inhalation | No Respirator | | AHETF | Mean | 0.219 |
| | | PF10 (C) | | AHETF | Mean | 0.022 |
| | | PF50 (D) | | AHETF | Mean | 0.0044 |
| | | Engineering control (closed loading system) | No respirator | AHETF | Mean | 0.011 |
| | | | PF10 (C) | AHETF | Mean | 0.0011 |
| Mixing / Loading Microencapsulates | Dermal | Single layer, no gloves (A) | | AHETF (MEA) | Mean | 220 |
| | | Single layer, gloves | | AHETF (MEA) | Mean | 37.6 |
| | | Double layer, gloves (B) | | AHETF (MEA) | Mean | 29.1 |
| | | Engineering control (closed loading system) | No gloves (A) | AHETF (MEA, *f*RA) | Mean | 30.4 |
| | | | Gloves | AHETF (MEA, *f*RA) | Mean | 4.02 |
| | Inhalation | No Respirator | | AHETF | Mean | 0.219 |
| | | PF10 (C) | | AHETF | Mean | 0.022 |
| | | PF50 (D) | | AHETF | Mean | 0.0044 |
| | | Engineering control (closed loading system) | No respirator | AHETF | Mean | 0.011 |
| | | | PF10 (C) | AHETF | Mean | 0.0011 |
| Mixing / Loading Wettable Powders | Dermal | Single layer, no gloves (A) | | AHETF | Mean | 77.7 |
| | | Single layer, gloves | | AHETF | Mean | 57.5 |
| | | Double layer, gloves (B) | | AHETF | Mean | 32.8 |
| | | Engineering control (water-soluble packaging) | No gloves (A) | AHETF (MEA) | Mean | 64 |
| | | | Gloves | AHETF (MEA) | Mean | 12.5 |

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|---|---|---|---|---|---|---|
| **Exposure Scenario**<br>**(Activity, Equipment, Formulation, Site, etc.)[1]** | | **Exposure Route** | **Personal Protective Equipment (PPE) Level[2]** | | **Data Source[3,4,5]** | **Statistic** | **Unit Exposure (µg/lb ai)** |

| Exposure Scenario | | Exposure Route | PPE Level | | Data Source | Statistic | Unit Exposure |
|---|---|---|---|---|---|---|---|
| | | Inhalation | No Respirator | | AHETF | Mean | 2.75 |
| | | | PF10 (C) | | AHETF | Mean | 0.275 |
| | | | PF50 (D) | | AHETF | Mean | 0.055 |
| | | | Engineering control (water-soluble packaging) | No Respirator | AHETF | Mean | 2.6 |
| | | | | PF10 (C) | AHETF | Mean | 0.26 |
| Applicator, Aerial, Fixed-Wing | Liquids | Dermal | Engineering control (Enclosed cockpit) | | AHETF (MEA) | Mean | 2.08 |
| | | Inhalation | Engineering control (Enclosed cockpit) | | AHETF (MEA) | Mean | 0.0049 |
| | Granules | Dermal | Engineering control (Enclosed cockpit) | | PHED | "Best fit" | 1.7 |
| | | Inhalation | Engineering control (Enclosed cockpit) | | PHED | Mean | 0.523 |
| Applicator, Aerosol Can | All sites (except animal treatments) | Dermal | Single layer, no gloves | | PHED | "Best fit" | 190000 |
| | | | Single layer, gloves | | PHED | "Best fit" | 81000 |
| | | | Double layer, gloves (B) | | PHED | "Best fit" | 64000 |
| | | Inhalation | No Respirator | | PHED | Mean | 1041 |
| | | | PF10 (C) | | PHED | Mean | 104.1 |
| | | | PF50 (D) | | PHED | Mean | 20.82 |
| | Animal (pet and livestock) treatments | Dermal | Single layer, no gloves | | MRID 44433302 | Mean | 544000 |
| | | | Single layer, gloves (E) | | MRID 44433302 | Mean | 503000 |
| | | | Double layer, gloves (B, E) | | MRID 44433302 | Mean | 273000 |
| | | Inhalation | No Respirator | | MRID 44433302 | Mean | 3270 |
| | | | PF10 (C) | | MRID 44433302 | Mean | 327 |
| | | | PF50 (D) | | MRID 44433302 | Mean | 66 |
| Applicator, Open Cab Airblast | | Dermal | Single layer, no gloves (A) | | AHETF | Mean | 1770 |
| | | | Single layer, gloves | | AHETF | Mean | 1590 |
| | | | Single layer, gloves, chemical-resistant hat | | AHETF (MEA) | Mean | 215 |
| | | | Double layer, gloves (B) | | AHETF | Mean | 1480 |
| | | | Double layer, gloves, chemical-resistant hat (B) | | AHETF (MEA) | Mean | 141 |
| | | | Engineering control | | AHETF (MEA) | Mean | 14.6 |

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|---|---|---|---|---|---|
| **Exposure Scenario**<br>**(Activity, Equipment, Formulation, Site, etc.)[1]** | **Exposure Route** | **Personal Protective Equipment (PPE) Level[2]** | **Data Source[3,4,5]** | **Statistic** | **Unit Exposure (µg/lb ai)** |
| | | (Enclosed Cab) | | | |
| | Inhalation | No Respirator | AHETF | Mean | 4.71 |
| | | PF10 (C) | AHETF | Mean | 0.471 |
| | | PF50 (D) | AHETF | Mean | 0.094 |
| | | Engineering control (Enclosed Cab) | AHETF | Mean | 0.068 |
| Applicator, Open Cab Groundboom<br>(tractor- and boat-mounted boom sprayers) | Dermal | Single layer, no gloves (A) | AHETF (MEA) | Mean | 78.6 |
| | | Single layer, gloves | AHETF (MEA) | Mean | 16.1 |
| | | Double layer, gloves (B) | AHETF (MEA) | Mean | 12.6 |
| | | Engineering control (Enclosed Cab) | PHED | "Best fit" | 5.1 |
| | Inhalation | No Respirator | AHETF | Mean | 0.34 |
| | | PF10 (C) | AHETF | Mean | 0.034 |
| | | PF50 (D) | AHETF | Mean | 0.0068 |
| | | Engineering control (Enclosed Cab) | PHED | Mean | 0.02 |
| Applicator, Open Cab Solid Broadcast Spreader<br>(tractor- and boat-drawn spreaders) | Dermal | Single layer, no gloves | PHED | "Best fit" | 9.9 |
| | | Single layer, gloves (E) | PHED | "Best fit" | 7.2 |
| | | Double layer, gloves (B, E) | PHED | "Best fit" | 4.2 |
| | | Engineering control (Enclosed Cab) | PHED | "Best fit" | 2.0 |
| | Inhalation | No Respirator | PHED | Mean | 0.518 |
| | | PF10 (C) | PHED | Mean | 0.0518 |
| | | PF50 (D) | PHED | Mean | 0.01 |
| | | Engineering control (Enclosed Cab) | PHED | Mean | 0.109 |
| Applicator, Granules by Hand | Dermal | Single layer, no gloves (A) | PHED | "Best fit" | 104000 |
| | | Single layer, gloves | PHED | "Best fit" | 71000 |
| | | Double layer, gloves (B) | PHED | "Best fit" | 40280 |
| | Inhalation | No Respirator | PHED | Mean | 380 |
| | | PF10 (C) | PHED | Mean | 38 |
| | | PF50 (D) | PHED | Mean | 7.6 |
| Loader/Applicator, Brush/roller | Dermal | Single layer, no gloves | PHED | "Best fit" | 180000 |
| | | Single layer, gloves (E) | PHED | "Best fit" | 24000 |
| | | Double layer, gloves (B, E) | PHED | "Best fit" | 22000 |
| | Inhalation | No Respirator | PHED | Mean | 197 |

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|---|---|---|---|---|---|
| **Exposure Scenario (Activity, Equipment, Formulation, Site, etc.)[1]** | **Exposure Route** | **Personal Protective Equipment (PPE) Level[2]** | **Data Source[3,4,5]** | **Statistic** | **Unit Exposure (µg/lb ai)** |
| | | PF10 (C) | PHED | Mean | 19.7 |
| | | PF50 (D) | PHED | Mean | 3.94 |
| Loader/Applicator, Airless Sprayer | Dermal | Single layer, no gloves | PHED / MRID 43600102 | Mean | 42600 |
| | | Single layer, gloves (E) | PHED / MRID 43600102 | Mean | 11700 |
| | | Double layer, gloves (B, E) | PHED / MRID 43600102 | Mean | 10600 |
| | Inhalation | No Respirator | PHED / MRID 43600102 | Mean | 560 |
| | | PF10 (C) | PHED / MRID 43600102 | Mean | 56 |
| | | PF10 (C) | PHED / MRID 43600102 | Mean | 11.2 |
| Flagger | Liquids | Dermal | Single layer, no gloves | PHED | "Best fit" | 11 |
| | | | Single layer, gloves | PHED | "Best fit" | 12 |
| | | | Double layer, gloves (B) | PHED | "Best fit" | 10.6 |
| | | Inhalation | No Respirator | PHED | Mean | 0.202 |
| | | | PF10 (C) | PHED | Mean | 0.02 |
| | | | PF50 (D) | PHED | Mean | 0.004 |
| | Granules | Dermal | Single layer, no gloves (F) | PHED | "Best fit" | 2.75 |
| | | | Single layer, gloves (E, F) | PHED | "Best fit" | 2.73 |
| | | | Double layer, gloves (E, G) | PHED | "Best fit" | 1.59 |
| | | Inhalation | No Respirator | PHED | Mean | 0.127 |
| | | | PF10 (C) | PHED | Mean | 0.0127 |
| | | | PF50 (D) | PHED | Mean | 0.0025 |
| Loader / Applicator, Belly Grinder | Dermal | Single layer, no gloves | PHED | "Best fit" | 10000 |
| | | Single layer, gloves | PHED | "Best fit" | 9300 |
| | | Double layer, gloves (B) | PHED | "Best fit" | 5700 |
| | Inhalation | No Respirator | PHED | Mean | 80.6 |
| | | PF10 (C) | PHED | Mean | 8.06 |
| | | PF50 (D) | PHED | Mean | 1.61 |
| Loader / Applicator, "Push-type" Rotary Spreader | Dermal | Single layer, no gloves | ORETF | Mean | 440 |
| | | Single layer, gloves | ORETF | Mean | 240 |
| | | Double layer, gloves (B) | ORETF | Mean | 130 |
| | Inhalation | No Respirator | ORETF | Mean | 10 |

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|---|---|---|---|---|---|---|
| **Exposure Scenario**<br>**(Activity, Equipment, Formulation, Site, etc.)[1]** | | **Exposure Route** | **Personal Protective Equipment (PPE) Level[2]** | **Data Source[3,4,5]** | **Statistic** | **Unit Exposure (µg/lb ai)** |
| | | | PF10 (C) | ORETF | Mean | 1.0 |
| | | | PF50 (D) | ORETF | Mean | 0.2 |
| Mixer / Loader / Applicator, Manually-pressurized Handwand | | Dermal | Greenhouses, Wildlife management, Nurseries, Landscaping (turf, trees/bushes/shrubs, plants/flowers), Industrial/Commercial areas, Barn/Feedlot, Poultry house/bird treatment, Animal treatments, Interior landscaping, Aquatic areas, Exterior building components, Mushroom houses, Christmas Tree Farms, Mounds/nests → Single layer, no gloves | PHED | "Best fit" | 100000 |
| | | | Single layer, gloves | PHED | "Best fit" | 430 |
| | | | Double layer, gloves (B) | PHED | "Best fit" | 365 |
| | | Inhalation | No Respirator | PHED | Mean | 23.6 |
| | | | PF10 (C) | PHED | Mean | 2.36 |
| | | | PF50 (D) | PHED | Mean | 0.472 |
| | | Dermal | Food handling establishments, Warehouses, Structural treatments, Residential Living Spaces, Childcare centers/schools → Single layer, no gloves (A) | PHED | "Best fit" | 29000 |
| | | | Single layer, gloves | PHED | "Best fit" | 8600 |
| | | | Double layer, gloves (B) | PHED | "Best fit" | 6200 |
| | | Inhalation | No Respirator | PHED | Mean | 1044 |
| | | | PF10 (C) | PHED | Mean | 104 |
| | | | PF50 (D) | PHED | Mean | 21 |
| Mixer / Loader / Applicator, Backpack Sprayer | General Broadcast/Foliar Applications | Dermal | Poultry house/bird treatments, Barn/Feedlot, Industrial/Commercial areas, Animal/Livestock treatments, Structural treatments → Single layer, no gloves (A) | PHED | "Best fit" | 2510 |
| | | | Single layer, gloves | PHED | "Best fit" | 2500 |
| | | | Double layer, gloves (B) | PHED | "Best fit" | 1600 |
| | | Inhalation | No Respirator | PHED | Mean | 27.6 |
| | | | PF10 (C) | PHED | Mean | 2.76 |
| | | | PF50 (D) | PHED | Mean | 0.552 |
| | | Dermal | Greenhouses → Single layer, no gloves (A) | AHETF | Mean | 13200 |
| | | | Single layer, gloves | AHETF | Mean | 11200 |
| | | | Double layer, gloves (B) | AHETF | Mean | 6230 |
| | | Inhalation | No Respirator | AHETF | Mean | 140 |
| | | | PF10 (C) | AHETF | Mean | 14 |
| | | | PF50 (D) | AHETF | Mean | 2.8 |
| | | Dermal | Nurseries, Christmas Tree Farms, Wildlife management, Rights-of-way, → Single layer, no gloves (A) | AHETF (MEA, *f*RA) | Mean | 58400 |
| | | | Single layer, gloves | AHETF (MEA, *f*RA) | Mean | 30500 |
| | | | Double layer, gloves (B) | AHETF (MEA, *f*RA) | Mean | 16900 |

| Exposure Scenario (Activity, Equipment, Formulation, Site, etc.)[1] | | | Exposure Route | Personal Protective Equipment (PPE) Level[2] | Data Source[3,4,5] | Statistic | Unit Exposure (µg/lb ai) |
|---|---|---|---|---|---|---|---|
| | | Forestry, Conifer Plantations, Landscaping (turf/plants/bushes/trees) | Inhalation | No Respirator | AHETF | Mean | 69.1 |
| | | | | PF10 (C) | AHETF | Mean | 6.91 |
| | | | | PF50 (D) | AHETF | Mean | 1.38 |
| | | Foundation/perimeter treatments, Aquatic areas[4] | Dermal | Single layer, no gloves (A) | MRID 44339801 | Mean | 8260 |
| | | | | Single layer, gloves | MRID 44339801 | Mean | 8260 |
| | | | | Double layer, gloves (B) | MRID 44339801 | Mean | 4120 |
| | | | Inhalation | No Respirator | MRID 44339801 | Mean | 2.58 |
| | | | | PF10 (C) | MRID 44339801 | Mean | 0.258 |
| | | | | PF50 (D) | MRID 44339801 | Mean | 0.052 |
| | Ground/Soil-directed (e.g., drench treatments, herbicides in orchards, vineyards, and tree farms)[5] | | Dermal | Single layer, no gloves (A) | MRID 44339801 | Mean | 8260 |
| | | | | Single layer, gloves | MRID 44339801 | Mean | 8260 |
| | | | | Double layer, gloves (B) | MRID 44339801 | Mean | 4120 |
| | | | Inhalation | No Respirator | MRID 44339801 | Mean | 2.58 |
| | | | | PF10 (C) | MRID 44339801 | Mean | 0.258 |
| | | | | PF50 (D) | MRID 44339801 | Mean | 0.052 |
| | Granule formulation applications | | Dermal | Single layer, no gloves (A) | MRID 45167201 | Mean | 155 |
| | | | | Single layer, gloves | MRID 45167201 | Mean | 144 |
| | | | | Double layer, gloves (B) | MRID 45167201 | Mean | 72.6 |
| | | | Inhalation | No Respirator | MRID 45250702 / MRID 45167201 | Mean | 23.8 |
| | | | | PF10 (C) | MRID 45250702 / MRID 45167201 | Mean | 2.38 |
| | | | | PF50 (D) | MRID 45250702 / MRID 45167201 | Mean | 0.476 |
| Mixer / Loader / Applicator, Mechanically-pressurized Handgun Sprayer | Orchards, Vineyards, Specialty Agricultural Crops, Rights-of-way, Landscaping (non-turf), Industrial/Commercial areas, Aquatic areas, Wildlife management, Christmas Tree farms | | Dermal | Single layer, no gloves (A) | AHETF (MEA) | Mean | 6050 |
| | | | | Single layer, gloves | AHETF (MEA) | Mean | 2050 |
| | | | | Double layer, gloves (B) | AHETF (MEA) | Mean | 1360 |
| | | | Inhalation | No Respirator | AHETF | Mean | 8.68 |
| | | | | PF10 (C) | AHETF | Mean | 0.868 |
| | | | | PF50 (D) | AHETF | Mean | 0.174 |
| | Structural treatments, Warehouses, Poultry house/bird treatments, Barn/Feedlot, Animal/Livestock treatments | | Dermal | Single layer, no gloves | PHED | "Best fit" | 1800 |
| | | | | Single layer, gloves | PHED | "Best fit" | 640 |
| | | | | Double layer, gloves (B) | PHED | "Best fit" | 365 |
| | | | Inhalation | No Respirator | PHED | Mean | 45.5 |
| | | | | PF10 (C) | PHED | Mean | 4.55 |
| | | | | PF50 (D) | PHED | Mean | 0.91 |

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|---|---|---|---|---|---|---|
| **Exposure Scenario**<br>**(Activity, Equipment, Formulation, Site, etc.)[1]** | | | **Exposure Route** | **Personal Protective Equipment (PPE) Level[2]** | **Data Source[3,4,5]** | **Statistic** | **Unit Exposure (µg/lb ai)** |
| Turf (lawns, fields, golf courses) | Greenhouses, Nurseries, Mushroom houses | | Dermal | Single layer, no gloves (A) | AHETF (*f*RA) | Mean | 5950 |
| | | | | Single layer, gloves | AHETF (*f*RA) | Mean | 3610 |
| | | | | Double layer, gloves (B) | AHETF (*f*RA) | Mean | 2990 |
| | | | Inhalation | No Respirator | AHETF | Mean | 448 |
| | | | | PF10 (C) | AHETF | Mean | 44.8 |
| | | | | PF50 (D) | AHETF | Mean | 8.96 |
| | Liquids | | Dermal | Single layer, no gloves (A) | ORETF | Mean | 1140 |
| | | | | Single layer, gloves | ORETF | Mean | 880 |
| | | | | Double layer, gloves (B) | ORETF | Mean | 450 |
| | | | Inhalation | No Respirator | ORETF | Mean | 1.9 |
| | | | | PF10 (C) | ORETF | Mean | 0.19 |
| | | | | PF50 (D) | ORETF | Mean | 0.038 |
| | Water-dispersible Granules | | Dermal | Single layer, no gloves (A) | ORETF | Mean | 1960 |
| | | | | Single layer, gloves | ORETF | Mean | 1400 |
| | | | | Double layer, gloves (B) | ORETF | Mean | 740 |
| | | | Inhalation | No Respirator | ORETF | Mean | 42 |
| | | | | PF10 (C) | ORETF | Mean | 4.2 |
| | | | | PF50 (D) | ORETF | Mean | 0.84 |
| | Wettable Powders | | Dermal | Single layer, no gloves (A) | ORETF | Mean | 1650 |
| | | | | Single layer, gloves | ORETF | Mean | 1210 |
| | | | | Double layer, gloves (B) | ORETF | Mean | 630 |
| | | | Inhalation | No Respirator | ORETF | Mean | 250 |
| | | | | PF10 (C) | ORETF | Mean | 25 |
| | | | | PF50 (D) | ORETF | Mean | 5 |
| | Water-soluble Packets | | Dermal | Single layer, no gloves (A) | ORETF | Mean | 1350 |
| | | | | Single layer, gloves | ORETF | Mean | 855 |
| | | | | Double layer, gloves (B) | ORETF | Mean | 458 |
| | | | Inhalation | No Respirator | ORETF | Mean | 18 |
| | | | | PF10 (C) | ORETF | Mean | 1.8 |
| | | | | PF50 (D) | ORETF | Mean | 0.36 |
| Mixer / Loader / Applicator, Handheld/Portable Fogger/Mister | | | Dermal | No data available | | | |
| | | | Inhalation | No Respirator | MRID 49602401 | Mean | 8916 |
| | | | | PF10 (C) | MRID 49602401 | Mean | 892 |
| | | | | PF50 (D) | MRID 49602401 | Mean | 178 |
| Mixer / Loader / Applicator, Stationary/Automatic Fogger/Mister (without re-entry restriction) | | | Dermal | No data available | | | |
| | | | Inhalation | No Respirator | MRID 49602401 | Mean | 8916 |

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| **Exposure Scenario**<br>**(Activity, Equipment, Formulation, Site, etc.)[1]** | | **Exposure Route** | **Personal Protective Equipment (PPE) Level[2]** | **Data Source[3,4,5]** | **Statistic** | **Unit Exposure (µg/lb ai)** |
| | | | PF10 (C) | MRID 49602401 | Mean | 892 |
| | | | PF50 (D) | MRID 49602401 | Mean | 178 |
| Applicator, Stationary/Automatic Fogger/Mister (with re-entry restriction) | | Applicator not present, exposure assumed negligible. | | | | |
| Applicator, Truck-mounted Fogger/Mister | | Dermal | Single layer, no gloves (A) | AHETF | Mean | 1770 |
| | | | Single layer, gloves | AHETF | Mean | 1590 |
| | | | Single layer, gloves, chemical-resistant hat | AHETF (MEA) | Mean | 215 |
| | | | Double layer, gloves (B) | AHETF | Mean | 1480 |
| | | | Double layer, gloves, chemical-resistant hat (B) | AHETF (MEA) | Mean | 141 |
| | | | Engineering control (Enclosed Cab) | AHETF (MEA) | Mean | 14.6 |
| | | Inhalation | No Respirator | AHETF | Mean | 4.71 |
| | | | PF10 (C) | AHETF | Mean | 0.471 |
| | | | PF50 (D) | AHETF | Mean | 0.094 |
| | | | Engineering control (Enclosed Cab) | AHETF | Mean | 0.068 |
| Mixer/Loader/Applicator, Termiticide Injection | | Dermal | Single layer, no gloves (A) | PHED | "Best fit" | 1300 |
| | | | Single layer, gloves | PHED | "Best fit" | 360 |
| | | | Double layer, gloves (B) | PHED | "Best fit" | 250 |
| | | Inhalation | No Respirator | PHED | Mean | 2.79 |
| | | | PF10 (C) | PHED | Mean | 0.279 |
| | | | PF50 (D) | PHED | Mean | 0.056 |
| Pour in/on | Liquids | Dermal | Single layer, no gloves (A) | AHETF (MEA) | Mean | 220 |
| | | | Single layer, gloves | AHETF (MEA) | Mean | 37.6 |
| | | | Double layer, gloves (B) | AHETF (MEA) | Mean | 29.1 |
| | | Inhalation | No Respirator | AHETF | Mean | 0.219 |
| | | | PF10 (C) | AHETF | Mean | 0.022 |
| | | | PF50 (D) | AHETF | Mean | 0.0044 |
| | Granules | Dermal | Single layer, no gloves (A) | AHETF (MEA) | Mean | 23.6 |
| | | | Single layer, gloves | AHETF (MEA) | Mean | 8.12 |
| | | | Double layer, gloves (B) | AHETF (MEA) | Mean | 5.80 |
| | | Inhalation | No Respirator | AHETF | Mean | 0.825 |
| | | | PF10 (C) | AHETF | Mean | 0.083 |
| | | | PF50 (D) | AHETF | Mean | 0.017 |

| USEPA / Office of Pesticide Programs / Health Effects Division Occupational Pesticide Handler Unit Exposure Surrogate Reference Table | | | | | | |
|---|---|---|---|---|---|---|
| **Exposure Scenario (Activity, Equipment, Formulation, Site, etc.)[1]** | | **Exposure Route** | **Personal Protective Equipment (PPE) Level[2]** | **Data Source[3,4,5]** | **Statistic** | **Unit Exposure (µg/lb ai)** |
| | Dusts | Dermal | Single layer, no gloves (A) | AHETF (MEA) | Mean | 227 |
| | | | Single layer, gloves | AHETF (MEA) | Mean | 51.6 |
| | | | Double layer, gloves (B) | AHETF (MEA) | Mean | 41.2 |
| | | | Engineering control (water-soluble packaging) | AHETF (MEA) | Mean | 12.5 |
| | | Inhalation | No Respirator | AHETF | Mean | 8.96 |
| | | | PF10 (C) | AHETF | Mean | 0.896 |
| | | | PF50 (D) | AHETF | Mean | 0.179 |
| | | | Engineering control (water-soluble packaging) | AHETF | Mean | 2.6 |
| Animal (pet and livestock) Treatments | Back rubber | Dermal | Single layer, no gloves (A) | AHETF (MEA) | Mean | 220 |
| | | | Single layer, gloves | AHETF (MEA) | Mean | 37.6 |
| | | | Double layer, gloves (B) | AHETF (MEA) | Mean | 29.1 |
| | | Inhalation | No Respirator | AHETF | Mean | 0.219 |
| | | | PF10 (C) | AHETF | Mean | 0.022 |
| | | | PF50 (D) | AHETF | Mean | 0.0044 |
| | Collar | Dermal | Single layer, no gloves (A) | MRID 44433303 | Mean | 112000 |
| | | | Single layer, gloves | MRID 44433303 | Mean | 67800 |
| | | | Double layer, gloves (B) | MRID 44433303 | Mean | 42000 |
| | | Inhalation | No Respirator | Applicator inhalation exposure expected to be negligible. | | |
| | | | PF10 (C) | | | |
| | | | PF50 (D) | | | |
| | Dip | Dermal | Single layer, no gloves (F) | MRID 45528801 | Mean | 54300 |
| | | | Single layer, gloves (F, E) | MRID 45528801 | Mean | 53400 |
| | | | Double layer, gloves (G, E) | MRID 45528801 | Mean | 25600 |
| | | Inhalation | No Respirator | MRID 45528801 | Mean | 26.6 |
| | | | PF10 (C) | MRID 45528801 | Mean | 2.66 |
| | | | PF50 (D) | MRID 45528801 | Mean | 0.532 |
| | Dust bag | Dermal | Single layer, no gloves (A) | AHETF (MEA) | Mean | 227 |
| | | | Single layer, gloves | AHETF (MEA) | Mean | 51.6 |
| | | | Double layer, gloves (B) | AHETF (MEA) | Mean | 41.2 |
| | | Inhalation | No Respirator | AHETF | Mean | 8.96 |
| | | | PF10 (C) | AHETF | Mean | 0.896 |
| | | | PF50 (D) | AHETF | Mean | 0.179 |
| | Ear tag | | | Applicator exposure expected to be negligible; chemical-resistant gloves recommended. | | |
| | Feed-through | Liquids | Dermal | Single layer, no gloves (A) | AHETF (MEA) | Mean | 220 |

| Exposure Scenario (Activity, Equipment, Formulation, Site, etc.)[1] | | | Exposure Route | Personal Protective Equipment (PPE) Level[2] | Data Source[3,4,5] | Statistic | Unit Exposure (µg/lb ai) |
|---|---|---|---|---|---|---|---|
| | | Dust | | Single layer, gloves | AHETF (MEA) | Mean | 37.6 |
| | | | | Double layer, gloves (B) | AHETF (MEA) | Mean | 29.1 |
| | | | Inhalation | No Respirator | AHETF | Mean | 0.219 |
| | | | | PF10 (C) | AHETF | Mean | 0.022 |
| | | | | PF50 (D) | AHETF | Mean | 0.0044 |
| | | | Dermal | Single layer, no gloves (A) | AHETF (MEA) | Mean | 227 |
| | | | | Single layer, gloves | AHETF (MEA) | Mean | 51.6 |
| | | | | Double layer, gloves (B) | AHETF (MEA) | Mean | 41.2 |
| | | | Inhalation | No Respirator | AHETF | Mean | 8.96 |
| | | | | PF10 (C) | AHETF | Mean | 0.896 |
| | | | | PF50 (D) | AHETF | Mean | 0.179 |
| | | Granules | Dermal | Single layer, no gloves (A) | AHETF (MEA) | Mean | 23.6 |
| | | | | Single layer, gloves | AHETF (MEA) | Mean | 8.12 |
| | | | | Double layer, gloves (B) | AHETF (MEA) | Mean | 5.80 |
| | | | Inhalation | No Respirator | AHETF | Mean | 0.825 |
| | | | | PF10 (C) | AHETF | Mean | 0.083 |
| | | | | PF50 (D) | AHETF | Mean | 0.017 |
| | Shampoo | | Dermal | Single layer, no gloves (F) | MRID 44658401 | Mean | 2098000 |
| | | | | Single layer, gloves (E, F) | MRID 44658401 | Mean | 2052000 |
| | | | | Double layer, gloves (E, B) | MRID 44658401 | Mean | 1029000 |
| | | | Inhalation | No Respirator | MRID 44658401 | Mean | 292 |
| | | | | PF10 (C) | MRID 44658401 | Mean | 29.2 |
| | | | | PF50 (D) | MRID 44658401 | Mean | 5.84 |
| | Sponge | | Dermal | Single layer, no gloves (F) | MRID 45528801 | Mean | 844000 |
| | | | | Single layer, gloves (F, E) | MRID 45528801 | Mean | 767000 |
| | | | | Double layer, gloves (G, E) | MRID 45528801 | Mean | 386000 |
| | | | Inhalation | No Respirator | MRID 45528801 | Mean | 208 |
| | | | | PF10 (C) | MRID 45528801 | Mean | 20.8 |
| | | | | PF50 (D) | MRID 45528801 | Mean | 4.16 |
| | Spot-on | | Dermal | Single layer, no gloves (A) | MRID 44433303 | Mean | 112000 |
| | | | | Single layer, gloves | MRID 44433303 | Mean | 67800 |
| | | | | Double layer, gloves (B) | MRID 44433303 | Mean | 42000 |
| | | | Inhalation | No Respirator | Applicator inhalation exposure expected to be negligible. | | |
| | | | | PF10 (C) | | | |
| | | | | PF50 (D) | | | |
| Loader / applicator, Bulb duster | | | Dermal | Single layer, no gloves | ORETF | Mean | 166000 |

| USEPA / Office of Pesticide Programs / Health Effects Division Occupational Pesticide Handler Unit Exposure Surrogate Reference Table | | | | | | |
|---|---|---|---|---|---|---|
| **Exposure Scenario (Activity, Equipment, Formulation, Site, etc.)[1]** | | **Exposure Route** | **Personal Protective Equipment (PPE) Level[2]** | **Data Source[3,4,5]** | **Statistic** | **Unit Exposure (µg/lb ai)** |
| | | | Single layer, gloves (E) | ORETF | Mean | 24700 |
| | | | Double layer, gloves (E, B) | ORETF | Mean | 20600 |
| | | Inhalation | No Respirator | ORETF | Mean | 1690 |
| | | | PF10 (C) | ORETF | Mean | 169 |
| | | | PF50 (D) | ORETF | Mean | 33.8 |
| Applicator, Wipe/Towelette | | Dermal | Single layer, no gloves | AEATFII | Mean | 2380000 |
| | | | Single layer, gloves (E) | AEATFII | Mean | 238000 |
| | | | Double layer, gloves (E, B) | AEATFII | Mean | 238000 |
| | | Inhalation | No Respirator | AEATFII | Mean | 480 |
| | | | PF10 (C) | AEATFII | Mean | 48 |
| | | | PF50 (D) | AEATFII | Mean | 9.6 |
| Loader / applicator, Cup | | Dermal | Single layer, no gloves | MRID 45333401 | Mean | 112 |
| | | | Single layer, gloves (E) | MRID 45333401 | Mean | 11.2 |
| | | | Double layer, gloves (E) | MRID 45333401 | Mean | 11.2 |
| | | Inhalation | No Respirator | MRID 45333401 | Mean | 12.5 |
| | | | PF10 (C) | MRID 45333401 | Mean | 1.25 |
| | | | PF50 (D) | MRID 45333401 | Mean | 0.25 |
| Loader / applicator, Spoon | | Dermal | Single layer, no gloves (A, F) | MRID 45250702 | Mean | 4170 |
| | | | Single layer, gloves (F) | MRID 45250702 | Mean | 3030 |
| | | | Double layer, gloves (A, G) | MRID 45250702 | Mean | 1580 |
| | | Inhalation | No Respirator | MRID 45250702 | Mean | 121 |
| | | | PF10 (C) | MRID 45250702 | Mean | 12.1 |
| | | | PF50 (D) | MRID 45250702 | Mean | 2.42 |
| Single-use Injection (gels/pastes) | | Applicator exposure expected to be negligible. | | | | |
| Loader / applicator, Plunger duster | | Dermal | Single layer, no gloves | ORETF | Mean | 166000 |
| | | | Single layer, gloves (E) | ORETF | Mean | 24700 |
| | | | Double layer, gloves (E, B) | ORETF | Mean | 20600 |
| | | Inhalation | No Respirator | ORETF | Mean | 1690 |
| | | | PF10 (C) | ORETF | Mean | 169 |
| | | | PF50 (D) | ORETF | Mean | 33.8 |
| Applicator, Total-release Fogger | | Applicator exposure expected to be negligible. | | | | |
| Applicator, Tree Injection | | Applicator exposure expected to be negligible. | | | | |
| Applicator, Trigger-spray Bottle | All application sites, except animals | Dermal | Single layer, no gloves (A) | ORETF | Mean | 3660 |
| | | | Single layer, gloves | ORETF | Mean | 1800 |
| | | | Double layer, gloves (B) | ORETF | Mean | 1110 |
| | | Inhalation | No Respirator | ORETF | Mean | 61.2 |

| USEPA / Office of Pesticide Programs / Health Effects Division — Occupational Pesticide Handler Unit Exposure Surrogate Reference Table | | | | | |
|---|---|---|---|---|---|
| Exposure Scenario (Activity, Equipment, Formulation, Site, etc.)[1] | Exposure Route | Personal Protective Equipment (PPE) Level[2] | Data Source[3,4,5] | Statistic | Unit Exposure (µg/lb ai) |
| | | | MRID 41054701 | | |
| | | | MRID 44739301 | | |
| | | PF10 (C) | ORETF | Mean | 6.12 |
| | | | MRID 41054701 | | |
| | | | MRID 44739301 | | |
| | | PF50 (D) | ORETF | Mean | 1.22 |
| | | | MRID 41054701 | | |
| | | | MRID 44739301 | | |
| Animal treatments | Dermal | Single layer, no gloves (F) | MRID 44433302 | Mean | 544000 |
| | | Single layer, gloves (F, E) | MRID 44433302 | Mean | 503000 |
| | | Double layer, gloves (G, E) | MRID 44433302 | Mean | 273000 |
| | Inhalation | No Respirator | MRID 44433302 | Mean | 3300 |
| | | PF10 (C) | MRID 44433302 | Mean | 330 |
| | | PF50 (D) | MRID 44433302 | Mean | 66 |
| Granules | Dermal | Single layer, no gloves | MRID 45333401 | Mean | 112 |
| | | Single layer, gloves (E) | MRID 45333401 | Mean | 11.2 |
| | | Double layer, gloves (E) | MRID 45333401 | Mean | 11.2 |
| | Inhalation | No Respirator | MRID 45333401 | Mean | 12.5 |
| | | PF10 (C) | MRID 45333401 | Mean | 1.25 |
| | | PF50 (D) | MRID 45333401 | Mean | 0.25 |
| Applicator, Shaker can / Dusts | Dermal | Single layer, no gloves | MRID 44439901 / MRID 45519601 | Mean | 4042000 |
| | | Single layer, gloves | MRID 44439901 / MRID 45519601 | Mean | 110000 |
| | | Double layer, gloves (B) | MRID 44439901 / MRID 45519601 | Mean | 72600 |
| | Inhalation | No Respirator | MRID 44439901 / MRID 45519601 | Mean | 17500 |
| | | PF10 (C) | MRID 44439901 / MRID 45519601 | Mean | 1750 |
| | | PF50 (D) | MRID 44439901 / MRID 45519601 | Mean | 350 |
| Trap/bait station | Re-fillable | Dermal — Single layer, no gloves (A) | PHED | "Best fit" | 104000 |
| | | Single layer, gloves | PHED | "Best fit" | 71000 |
| | | Double layer, gloves (B) | PHED | "Best fit" | 40280 |
| | | Inhalation — No Respirator | PHED | Mean | 380 |

| USEPA / Office of Pesticide Programs / Health Effects Division<br>Occupational Pesticide Handler Unit Exposure Surrogate Reference Table | | | | | |
|---|---|---|---|---|---|
| Exposure Scenario<br>(Activity, Equipment, Formulation, Site, etc.)[1] | | Exposure Route | Personal Protective Equipment (PPE) Level[2] | Data Source[3,4,5] | Statistic | Unit Exposure (µg/lb ai) |
| | | | PF10 (C) | PHED | Mean | 38 |
| | | | PF50 (D) | PHED | Mean | 7.6 |
| | Single-use | Applicator exposure expected to be negligible. | | | |

[1] If the description of the scenario is silent on specific equipment, sites, formulations, etc., the data are applicable to all potential applications for that scenario.

[2] Single layer = long-sleeve shirt, long pants, shoes plus socks. Double layer = "coveralls" in addition to single layer.

Exposure monitoring data representing all levels of PPE for all scenarios are unavailable. In order to represent different PPE levels, exposure values are calculated using assumptions for the protection afforded by additional layers of clothing, chemical-resistant gloves, or respirators. Exposure assessors should be mindful of the uncertainties that this convention introduces into the overall calculations. In all cases, estimates based on direct measurements representing the PPE-level specified are the most reliable. If a scenario uses PPE calculation assumptions, they are identified in the table with one or more of the following notations:

(A) "No glove" hand exposure back-calculated from available "gloved hand" exposure data by multiplying by 10 (i.e., chemical-resistant gloves are assumed to reduce hand exposure by 90%).
(B) "Double layer" body exposure calculated from available "single layer" body exposure data by dividing by 2 (i.e., an additional layer of clothing is assumed to reduce body exposure by 50%).
(C) "PF10" respirator exposure calculated from available "no respirator" exposure data by dividing by 10 (i.e., a PF10 respirator is assumed to reduce inhalation exposure by 90%).
(D) "PF50" respirator exposure calculated from available "no respirator" exposure data by dividing by 50 (i.e., a PF50 respirator is assumed to reduce inhalation exposure by 98%).
(E) "Gloved" hand exposure calculated from available "no glove" hand exposure data by dividing by 10 (i.e., chemical-resistant gloves are assumed to reduce hand exposure by 90%).
(F) "Single layer" body exposure calculated from available "total deposition" body exposure data by dividing by 2 (i.e., an additional layer of clothing is assumed to reduce body exposure by 50%).
(G) "Double layer" body exposure calculated from available "total deposition" body exposure data by dividing by 4 (i.e., two layers of clothing are assumed to reduce body exposure by 75%).

If a scenario does not have one of these notations, the data underlying the recommended values is a direct match for the indicated level of PPE.

[3] PHED = Pesticide Handler Exposure Database; AHETF = Agricultural Handler Exposure Task Force; ORETF = Outdoor Residential Exposure Task Force; MRID = Master Record Identification (#).
[4] Where applicable, the notation "MEA" is added to signify that the default values reflect an (upward) adjustment by the U.S. EPA for potential inefficiency of the hand wash and face/neck wipe exposure monitoring methods. MEA = Method Efficiency Adjustment.
[5] Where applicable, the notation "*f*RA" is added to signify that the default value reflects an (upward) adjustment by the U.S. EPA to reflect that the underlying data did not meet benchmark accuracy objectives. *f*RA = fold Relative Accuracy.
[6] Due to the effect that the back-calculation from "gloved hands" to represent "non-gloved hands" has on distributional variability and parametric estimates, no adjustment was made to hand measurements to represent unit exposures for "single layer, no gloves". That is, the unit exposure for "single layer, gloves" is also assigned to "single layer, no gloves".

**Attachment 1**
**Documentation of Revisions**

| Date | Documentation of Revisions |
|------|----------------------------|
| Apr2011 | • Original version, modeled based on "PHED Surrogate Guide"<br>• Reflects move from data from PHED to AHETF for following scenarios<br>   ○ Open Cab Groundboom<br>   ○ Open Mix/Load Liquids<br>   ○ Open Mix/Load Dry Flowable<br>• Published EPA webpage on occupational pesticide handler exposure, including link to reference table |
| May2011 | • Replaced PHED values for "Closed Cab Airblast" with those from AHETF |
| Jun2011 | • Replaced PHED values for "Open Cab Airblast" with those from AHETF<br>• Corrected unit exposure for "Mixer / Loader / Applicator, Low-pressure Handwand, Wettable Powder, Double layer, gloves" from 620 µg/lb ai to 6200 µg/lb ai |
| Sep2011 | • Reflects overhaul of exposure scenario assignment of available surrogate data<br>   ○ New scenarios added (e.g., pet/animal treatments)<br>   ○ Scenario subsets added (e.g., power handgun site subsets)<br>   ○ Available individual proprietary studies assigned<br>• Footnotes edited<br>• Orientation changed to landscape to accommodate scenario additions |
| Mar2012 | • Corrected "Dip" and "Sponge" inhalation unit exposures to reflect use of ½ LOD without correction for field fortification per standard policy<br>• Corrected "Mixing / Loading Liquids" inhalation unit exposures to 2 significant figures<br>• Removed PPE footnote notation "(H)" since that does not apply to any scenario<br>• Corrected PPE notations for "Spoon" scenario to reflect exposure monitoring of "total deposition with chemical-resistant gloves"<br>• For "Mechanically-pressurized Handgun Sprayer", added "Specialty Agricultural Crops" to a sub-set category<br>• Added "Documentation of Revisions" as an attachment |
| Mar2013 | • Aerial Applicator scenario:  PHED replaced with data from the AHETF<br>• Re-assigned MRID45773201 to drench/soil-directed applications of wettable powders only<br>• Footnote (G) typographical correction:  "100%" corrected to "75%" (unit exposures are unchanged) |
| Sept2015 | • Additional livestock treatment scenarios incorporated (backpack and mechanically-pressurized handgun)<br>• Wildlife management incorporated into mechanically-pressurized handgun scenario<br>• Mushroom houses incorporated into mechanically-pressurized handgun scenario and manually-pressurized handwand scenario<br>• Granule formulations added to "animal, feed-through" scenario<br>• Characterized Animal treatments as "Pet" or "Livestock"<br>• Incorporated new data from AHETF for backpack applicator and mechanically-pressurized handgun applicators in rights-of-ways and other similar use patterns.<br>• Added tree injection applicator scenario. |
| Nov2016 | • Incorporated new data from AHETF for mixing/loading wettable powders and mixing/loading water-soluble packets<br>• Added clarifying footnotes to the "Data Source"<br>• Added scenario for "Mixer/Loader/Applicator, Fogging Equipment (handheld, portable, stationary)"<br>• Added scenario for "Applicator, Truck-mounted Fogger"<br>• Added scenario for "Applicator, Stationary Fogger (with re-entry restriction)"<br>• Added scenario for "Applicator, Wipe/Towelette" |

| | |
|---|---|
| | • Revised table formatting for "Applicator, Pour in/on" scenario |
| Jun2018 | • Replaced data for Open Pour Loading Granules with new AHETF data. Scenarios effected: Loading Granules as well as Feed-through and Pour in/on |
| | • PF5 respirators revised to PF10, bringing EPA up to date with long-standing assumptions and practice by the Occupational Safety and Health Administration (OSHA) and the National Institutes for the Occupational Safety and Health (NIOSH). |
| | • PF50 respirators added as a potential PPE option. |
| | • Separated and edited the "Mixer/Loader/Applicator, Fogging Equipment (handheld, portable, stationary)" into "Mixer/Loader/Applicator, Handheld/Portable Fogger/Mister" and "Mixer/Loader/Applicator, Automatic/Stationary Fogger/Mister (without re-entry restriction)" |
| | • Edited scenario for "Applicator, Truck-mounted Fogger" to "Applicator, Truck-mounted Fogger/Mister" |
| | • Edited scenario for "Applicator, Stationary Fogger (with re-entry restriction)" to "Applicator, Stationary/Automatic Fogger/Mister (with re-entry restriction)" |
| | • For manually pressurized handwand, clarified Structural treatments by adding a scenario for Exterior building components and moving Structural treatments to a different surrogate dataset |
| | • Added scenarios for Microencapsulate formulations with liquid AHETF data as the surrogate dataset |
| | • Removed inapplicable engineering control scenarios from Pour in/on scenarios |
| | • Edited "Paintbrush/roller" to "Brush/roller" |
| | • Corrected inhalation unit exposures for Handgun/Turf/Water-soluble Packets. Previously mistakenly showed values for liquid formulations (i.e., copy/paste error). EPA calculations, however, used correct unit exposures. |
| March2020 | • Added data from new AHETF study AHE1023 (Handgun Applications in Greenhouses/Nurseries), replacing PHED Scenario 35 previously used for greenhouse and mushroom house and replaces AHE1013 previously used for nursery scenarios |
| | • Removed MRID 45773201 as a surrogate data source [decision made during review of AHE1023 - Handgun Applications in Greenhouses/Nurseries; consideration of influence of formulation (WPs vs DFs) and study deficiencies (pre-measured bags)] |
| | • Updated select PHED scenarios to refine breathing rate assumption and use of arithmetic mean unit exposure: |
| |     o Applicator/aerial/granules (PHED Scenario 8); |
| |     o Aerosol can, non-animals (PHED Scenario 10); |
| |     o Applicator, Solid Broadcast Spreader, Open and Closed Cab (PHED Scenario 15 and 16); |
| |     o Applicator, Brush/Roller (PHED Scenario 22); |
| |     o Flagger, Liquids (PHED Scenario 25); |
| |     o Flagger, Granules (PHED Scenario 26); |
| |     o Loader/Applicator, Belly Grinder (PHED Scenario 30); |
| |     o Manually-pressurized Handwand (PHED Scenario 32); |
| |     o Manually-pressurized Handwand (PHED Scenario 33); |
| |     o Backpack Sprayer (PHED Scenario 34); |
| |     o Mech Pressurized Handgun (PHED Scenario 19); |
| |     o Applicator, Termiticide Injection (PHED Scenario 37); |
| |     o Applicator, Granules by Hand Dispersal (PHED Scenario 17); |
| |     o Applicator, Groundboom Enclosed Cab (PHED Scenario 14) |
| | • Added exposure scenarios for applications to "conifer plantations" |

| | |
|---|---|
| | • Revised "Exposure Scenario" labels to match Occupational Handler Exposure Calculator ([link](link)) |
| May 2021 | • Added data from new AHETF study AHE1022 (Mechanical Transfer of Liquids), replaces PHED Scenario 6 previously used for loading liquid pesticide formulations using closed loading systems<br>• Added data from new AHETF study AHE1016 (Closed System Loading of Solid Formulations) and EPA MRID 44180401 (Merricks, 1996), replaces PHED Scenario 6 previously used for loading solid formulation pesticide formulations using closed loading systems<br>• For closed loading systems and water-soluble packaging:  included unit exposures with and without chemical-resistant gloves and with and without respirators |