



Dioxin and Furan are the common names associated with polychlorinated dibenzo-p-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF). This group of primarily anthropogenic chemical compounds can be created as unintended byproducts of a number of human activities including: combustion, certain types of chemical production, chlorine bleaching of paper and other industrial processes. Extensive research has concluded that exposure to dioxins and furans can result in biochemical and biological effects in animals and humans. Because these ubiquitous compounds accumulate in biological tissues, dioxins and furans have been in the environmental spotlights for over two decades. Of these compounds, 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) is the most toxic and has been the most widely investigated.

More recently, researchers have discovered that certain polychlorinated biphenyls (PCBs) are similar in nature to dioxin and appear to pose similar risks to both animals and humans. For risk assessment purposes, a toxicity equivalence procedure has been developed to describe the cumulative toxicity of complex mixtures of these compounds, when encountered in the environment. The procedure involves assigning individual toxicity equivalency factors (TEF's) to the PCDD, PCDF, and PCB congeners in terms of their relative toxicity to 2,3,7,8-TCDD. Two sets of generally accepted TEF values are shown in the table below: the factors endorsed by the USEPA, and those accepted by the World Health Organization (WHO). Calculating the toxic equivalency (TEQ) of a mixture involves multiplying the concentrations of individual congeners by their respective TEF, then adding the individual TEQ's to obtain a total TEQ concentration for the mixture. Pace Analytical's standard Dioxin/Furan data package includes a TEF/TEQ result for each sample, using the USEPA accepted 1989 ITEF default factors to calculate the result. The WHO factors, or other specified factors, can be substituted upon request.

| | Specific Isomers | Compound Name | EPA/89List | WHO/2005 |
|--------|----------------------|-------------------------------|------------|----------|
| Dioxin | 1. 2378-TCDD | Tetrachlorodibenzo-p-dioxin | 1 | 1 |
| | 2. 12378-PeCDD | Pentachlorodibenzo-p-dioxin | 0.5 | 1 |
| | 3. 123678-HxCDD | Hexachlorodibenzo-p-dioxin | 0.1 | 0.1 |
| | 4. 123478-HxCDD | Hexachlorodibenzo-p-dioxin | 0.1 | 0.1 |
| | 5. 123789-HxCDD | Hexachlorodibenzo-p-dioxin | 0.1 | 0.1 |
| | 6. 1234678-HpCDD | Heptachlorodibenzo-p-dioxin | 0.01 | 0.01 |
| | 7. 12346789-OCDD | Octachlorodibenzo-p-dioxin | 0.001 | 0.0003 |
| Furan | 8. 2378-TCDF | Tetrachlorodibenzofuran | 0.1 | 0.1 |
| | 9. 12378-PeCDF | Pentachlorodibenzofuran | 0.05 | 0.03 |
| | 10. 23478-PeCDF | Pentachlorodibenzofuran | 0.5 | 0.3 |
| | 11. 123678-HxCDF | Hexachlorodibenzofuran | 0.1 | 0.1 |
| | 12. 123789-HxCDF | Hexachlorodibenzofuran | 0.1 | 0.1 |
| | 13. 123478-HxCDF | Hexachlorodibenzofuran | 0.1 | 0.1 |
| | 14. 234678-HxCDF | Hexachlorodibenzofuran | 0.1 | 0.1 |
| | 15. 1234678-HpCDF | Heptachlorodibenzofuran | 0.01 | 0.01 |
| | 16. 1234789-HpCDF | Heptachlorodibenzofuran | 0.01 | 0.01 |
| | 17. 12346789-OCDF | Octachlorodibenzofuran | 0.001 | 0.0003 |
| PCBs | 1. 33'44'-TeCB | Tetrachlorobiphenyl (PCB 77) | 0.0005 | 0.0001 |
| | 2. 344'5'-TCB | Tetrachlorobiphenyl (PCB 81) | - | 0.0003 |
| | 3. 233'44'-PeCB | Pentachlorobiphenyl (PCB 105) | 0.0001 | 0.00003 |
| | 4. 2344'5'-PeCB | Pentachlorobiphenyl (PCB 114) | 0.0005 | 0.00003 |
| | 5. 23'44'5'-PeCB | Pentachlorobiphenyl (PCB 118) | 0.0001 | 0.00003 |
| | 6. 2'344'5'-PeCB | Pentachlorobiphenyl (PCB 123) | 0.0001 | 0.00003 |
| | 7. 33'44'5'-PeCB | Pentachlorobiphenyl (PCB 126) | 0.1 | 0.1 |
| | 8. 233'44'5'-HxCB | Hexachlorobiphenyl (PCB 156) | 0.0005 | 0.00003 |
| | 9. 233'44'5'-HxCB | Hexachlorobiphenyl (PCB 157) | 0.0005 | 0.00003 |
| | 10. 23'44'55'-HxCB | Hexachlorobiphenyl (PCB 167) | 0.00001 | 0.00003 |
| | 11. 33'44'55'-HxCB | Hexachlorobiphenyl (PCB 169) | 0.01 | 0.03 |
| | 12. 22'33'44'5'-HpCB | Heptachlorobiphenyl (PCB 170) | 0.0001 | - |
| | 13. 22'344'55'-HpCB | Heptachlorobiphenyl (PCB 180) | 0.00001 | - |
| | 14. 233'44'55'-HpCB | Heptachlorobiphenyl (PCB 189) | 0.0001 | 0.00003 |