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# EVALUATION OF HOT MIX ASPHALT FOR LEACHABILITY

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## 0. INTRODUCTION

A standard hot mix asphalt surface mixture was prepared in the laboratory at Heritage Research. This mixture was then tested for TCLP (Toxic Characteristic Leachability Procedure) by EPA SW846-1311 and SW846-351 method. The leachate was then tested for metals, volatiles, semivolatiles, organics, and PAH's (Polynuclear Aromatic Hydrocarbons) to determine what materials, if any, were leachable from a new asphalt mixture.

## 0.1 MATERIALS

The asphalt cement used was an AC-20 asphalt cement from Asphalt Materials, Inc. in Indianapolis. The aggregate was a ASTM D448 #8 (12.5 mm) blast furnace slag from Levy Slag, a #8 stone (12.5 mm), and #24 natural sand from Martin Marietta in Indianapolis. The blend of materials is listed below.

| | % by Weight |
|---|---|
| #8 Slag | 23.4 |
| #8 Stone | 23.4 |
| Natural Sand | 46.7 |
| AC-20 | 6.5 |

The mixture met current INDOT (Indiana Department of Transportation) specifications according to INDOT 401.02 specifications.

## 1.0 LEACHATE TESTING

Leachate testing and analyses was performed by Heritage Environmental Services-Commercial Laboratory of Indianapolis. After the TCLP testing, the leachate was subjected to the following analyses:

| Test | Method/Procedure |
|---|---|
| TCLP | SW846-1311 |
| Semivolatiles GC/MS | SW846-3510 |
| PAH's | SW846-8310 |
| Metals | SW846-3010 |
| Volatiles | SW846-3510 |

### 1.1 METAL RESULTS

Table A lists the results of metal leachability. The metals selected are those heavy metals normally tested for by the EPA. The results show only chrome had a level above detection limit at 0.1 ppm. This is 50 fold below the level of hazardous by characteristic under RCRA (Resource Conservation Recovery Act). Since the asphalt does not typically contain measurable chrome levels, it is possible that the small level of chrome is coming from the slag aggregate, a by-product of the steel making process.

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### 1.2 VOLITILE ORGANIC RESULTS

Table B lists the volatile organic compounds of concern. The results are in parts per billion and show no measurable compound above detection limits. This procedure uses the zero head space TCLP method.

### 1.3 SEMIVOLATILE ORGANIC RESULTS

Table C lists the semivolatile organics after TCLP. Again, the results are in parts per billion and no measurable amounts were found above detection limits.

### 1.4 PAH ORGANIC RESULTS

Table D gives the results of leachable PAH's. These compounds are the highest molecular weight group of organic compounds routinely tested by the EPA. Because of asphalt's high molecular weight, there is a concern that these compounds could be present. The detection limits for these compounds are extremely low allowing measurement well below one part per billion. Only a quarter part per billion of naphthalene was found in the asphalt mix leachate. Naphthalene, the most volatile PAH, is well below any established guideline. Naphthalene is not carcinogenic like some of the other PAH's such as Benzo(A)pyrene carcinogenic, which were not found to be present.

## 2.0 CONCLUSIONS

The leachate testing on the #11 surface indicates very low levels of leachable compounds. These levels are well below any guidelines.

**TABLE A**
**Metal Leachates (1311)**

| Parameter | Result, mg/L | Detection Limit mg/L |
|---|---|---|
| Barium | BDL | 2.000 |
| Cadmium | BDL | 0.020 |
| Chromium | 0.10 | 0.010 |
| Lead | BDL | 0.200 |
| Silver | BDL | 0.040 |
| Arsenic | BDL | 0.005 |
| Selenium | BDL | 0.005 |
| Mercury | BDL | 0.005 |

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**TABLE B**
**Zero Head Space of TCLP Organic (3510)**

| Parameter | Result µ g/L | Detection Limit µ g/L |
|---|---|---|
| Benzene | BDL | 5 |
| Carbon Tetrachloride | BDL | 5 |
| Chlorobenzene | BDL | 5 |
| Chloroform | BDL | 5 |
| 1,2 dichloroehtylene | BDL | 5 |
| 1,1 dichloroethylene | BDL | 5 |
| Methyl Ethyl Ketone | BDL | 5 |
| Tetrachloroethylene | BDL | 5 |
| Trichloroethylene | BDL | 5 |
| Vinyl Chloride | BDL | 5 |

**TABLE C**
**TCLP Semi-Volatile Organics**

| Parameter | Result µ g/L | Detection Limit µ g/L |
|---|---|---|
| 1,4-Dichlorobenzene | BDL | 12 |
| 2,4-Dinitrotoluene | BDL | 12 |
| Hexachlorobenzene | BDL | 12 |
| Hexachlorobutadine | BDL | 12 |
| Hexachloroethane | BDL | 12 |
| Nitrobenzene | BDL | 12 |
| Pyridine | BDL | 60 |
| Cresylic Acid | BDL | 30 |
| 2-Methyl Phenol | BDL | 30 |
| 3-Methyl Phenol | BDL | 30 |
| 4-Methyl Phenol | BDL | 30 |
| Pentachlorophenol | BDL | 60 |
| 2,4,5-Trichlorophenol | BDL | 30 |
| 2,4,6-Trichlorophenol | BDL | 30 |

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**TABLE D**
**Polynuclear Aromatic Hydrocarbons by TCLP**

| Parameter | Result µ g/L | Detection Limit µ g/L |
|---|---|---|
| Naphthalene | 0.25 | 0.096 |
| Acenaphthylene | BDL | 0.15 |
| Acenaphthene | BDL | 0.194 |
| Fluorene | BDL | 0.023 |
| Phenanthrene | BDL | 0.033 |
| Anthracene | BDL | 0.015 |
| Fluoranthene | BDL | 0.037 |
| Pyrene | BDL | 0.04 |
| Benzo(A)Anthracene | BDL | 0.048 |
| Chrysene | BDL | 0.017 |
| Benzo(B)Fluoranthene | BDL | 0.02 |
| Benzo(K)Fluoranthene | BDL | 0.022 |
| Benzo(A)Pyrene | BDL | 0.023 |
| Dibenzo(A,H)Anthracene | BDL | 0.018 |
| Benzo(G,H,I)Perylene | BDL | 0.036 |
| Indeno(1,2,3-CD)Pyrene | BDL | 0.021 |

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