Slab representing cross section through top half of pavement, after treatment to enhance air voids and cracks, WB I-696, constructed 1995, away from transverse joint, core C, MTU ID 696-11, tie marks every half inch.
Slab representing cross section through bottom half of pavement, as polished, WB I-696, constructed 1995, away from transverse joint, core C, MTU ID 696-11, tic marks every half inch.
Slab representing cross section through bottom half of pavement, after sodium cobaltinitrite stain, WB I-696, constructed 1995, away from transverse joint, core C, MTU ID 696-11, tic marks every half inch.
Slab representing cross section through bottom half of pavement, after treatment to enhance air voids and cracks, WB I-696, constructed 1995, away from transverse joint, core C, MTU ID 696-11, tic marks every half inch.
Slabs representing full cross section through pavement, as polished, WB I-696, constructed 1995, away from transverse joint, core C, MTU ID 696-12, tic marks every inch.
Slabs representing full cross section through pavement, after sodium cobaltinitrite stain, WB I-696, constructed 1995, away from transverse joint, core C, MTU ID 696-12, tic marks every inch.
Slabs representing full cross section through pavement, after treatment to enhance air voids and cracks, WB I-696, constructed 1995, away from transverse joint, core C, MTU ID 696-12, tic marks every inch.
Slab representing cross section through top half of pavement, as polished, WB I-696, constructed 1995, away from transverse joint, core C, MTU ID 696-12, tic marks every half inch.
Slab representing cross section through top half of pavement, after sodium cobaltinitrite stain, WB I-696, constructed 1995, away from transverse joint, core C, MTU ID 696-12, tic marks every half inch.
Slab representing cross section through top half of pavement, after treatment to enhance air voids and cracks, WB I-696, constructed 1995, away from transverse joint, core C, MTU ID 696-12, tie marks every half inch.
Slab representing cross section through bottom half of pavement, as polished, WB I-696, constructed 1995, away from transverse joint, core C, MTU ID 696-12, tic marks every half inch.
Slab representing cross section through bottom half of pavement, after sodium cobaltinitrite stain, WB I-696, constructed 1995, away from transverse joint, core C, MTU ID 696-12, tic marks every half inch.
Slab representing cross section through bottom half of pavement, after treatment to enhance air voids and cracks, WB I-696, constructed 1995, away from transverse joint, core C, MTU ID 696-12, tic marks every half inch.
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### Results

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WB I-696, constructed 1978, at transverse joint, core B, MTU ID 696-07

Data Analysed - 9/18/ 6 at 14:34
Operator Name - Matt
Sample ID - 696-7

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WB I-696, constructed 1978, away from transverse joint, core C, MTU ID 696-02

Data Analysed - 8/21/6 at 17:42
Operator Name - Matt
Sample ID - 696-2

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WB I-696, constructed 1978, away from transverse joint, core D, MTU ID 696-01

Data Analysed - 8/14/6 at 16:26
Operator Name - Matt
Sample ID - 696_1

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I-696, constructed 1995, at transverse joint, core A, MTU ID 696-06

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Operator Name - Matt
Sample ID - 696-8

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Results

| Air vol% | 10.4 | 2.2 | 6.3 |
| Paste vol% | 30.2 | 31.0 | 30.6 |
| Aggregate vol% | 59.4 | 66.8 | 63.1 |
| Secondary Phase vol% | 0.0 | 0.0 | 0.0 |
| Spacing Factor (mm) | 0.137 | 0.125 | 0.170 |
| Paste/Air ratio | 2.89 | 14.00 | 4.83 |
| Specific Surface (mm^2/mm^3) | 21.2 | 59.0 | 26.9 |
| Void Frequency (voids/m) | 552 | 306 | 425 |
| Average Chord Length (mm) | 0.189 | 0.068 | 0.149 |
WB I-696, constructed 1995, away from transverse joint, core C, MTU ID 696-04

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<td>Air vol%</td>
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<tr>
<td>Paste vol%</td>
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<tr>
<td>Secondary Phase vol%</td>
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<td>Average Chord Length (mm)</td>
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I-696, constructed 1995, away from transverse joint, core D, MTU ID 696-03

Data Analysed - 8/22/6 at 12:9
Operator Name - Matt
Sample ID - 696-3

Raw Data

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Results

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### I-696 Core Site

I-696, constructed 1995, at transverse joint, core A, MTU ID 696-09

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#### Raw Data

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<td>Total Traverse Length (mm)</td>
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<td>1886.041</td>
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#### Results

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WB I-696, constructed 1995, away from transverse joint, core C, MTU ID 696-11

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I-696, constructed 1995, away from transverse joint, core D, MTU ID 696-12

**Data Analysed - 5/14/7 at 16:55**

**Operator Name - Matt**

**Sample ID - 696-12**

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### Results

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Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, at transverse joint, top half of core A, MTU ID 696-06.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, at transverse joint, top half of core A, MTU ID 696-06.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, at transverse joint, top half of core A, MTU ID 696-06.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, at transverse joint, top half of core A, MTU ID 696-06.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, at transverse joint, bottom half of core A, MTU ID 696-06.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, at transverse joint, bottom half of core A, MTU ID 696-06.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, away from transverse joint, top half of core D, MTU ID 696-03.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, away from transverse joint, top half of core D, MTU ID 696-03.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, away from transverse joint, top half of core D, MTU ID 696-03.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, away from transverse joint, bottom half of core D, MTU ID 696-03.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, away from transverse joint, bottom half of core D, MTU ID 696-03.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, away from transverse joint, bottom half of core D, MTU ID 696-03.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, away from transverse joint, bottom half of core D, MTU ID 696-03.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, at transverse joint, top half of core A, MTU ID 696-09.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, at transverse joint, top half of core A, MTU ID 696-09.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, at transverse joint, top half of core A, MTU ID 696-09.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, at transverse joint, top half of core A, MTU ID 696-09.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrile stain, polished slab from I-696, constructed 1995, at transverse joint, top half of core A, MTU ID 696-09.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, at transverse joint, top half of core A, MTU ID 696-09.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, at transverse joint, bottom half of core A, MTU ID 696-09.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, at transverse joint, bottom half of core A, MTU ID 696-09.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, at transverse joint, bottom half of core A, MTU ID 696-09.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, at transverse joint, bottom half of core A, MTU ID 696-09.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, at transverse joint, bottom half of core A, MTU ID 696-09.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, at transverse joint, bottom half of core A, MTU ID 696-09.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrile stain, polished slab from I-696, constructed 1995, at transverse joint, bottom half of core A, MTU ID 696-09.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, at transverse joint, bottom half of core A, MTU ID 696-09. Note voids in slag aggregate particle filled with alkali-silica reaction product.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, at transverse joint, bottom half of core A, MTU ID 696-09.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrile stain, polished slab from I-696, constructed 1995, away from transverse joint, top half of core C, MTU ID 696-11.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, away from transverse joint, top half of core C, MTU ID 696-11.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrile stain, polished slab from I-696, constructed 1995, away from transverse joint, top half of core C, MTU ID 696-11.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, away from transverse joint, top half of core C, MTU ID 696-11.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, away from transverse joint, top half of core C, MTU ID 696-11.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, away from transverse joint, top half of core C, MTU ID 696-11.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrile stain, polished slab from I-696, constructed 1995, away from transverse joint, top half of core C, MTU ID 696-11.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrile stain, polished slab from I-696, constructed 1995, away from transverse joint, bottom half of core C, MTU ID 696-11.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, away from transverse joint, bottom half of core C, MTU ID 696-11.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, away from transverse joint, bottom half of core C, MTU ID 696-11.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, away from transverse joint, bottom half of core C, MTU ID 696-11.
Alkali silica reaction in fine aggregate and nearby air void filled with reaction product, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, away from transverse joint, bottom half of core C, MTU ID 696-11.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitritite stain, polished slab from I-696, constructed 1995, away from transverse joint, bottom half of core C, MTU ID 696-11.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, away from transverse joint, top half of core D, MTU ID 696-12.
Alkali silica reaction in fine aggregate and adjacent voids filled with reaction product, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, away from transverse joint, top half of core D, MTU ID 696-12.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, away from transverse joint, top half of core D, MTU ID 696-12.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, away from transverse joint, top half of core D, MTU ID 696-12.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, away from transverse joint, top half of core D, MTU ID 696-12.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, away from transverse joint, top half of core D, MTU ID 696-12.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrile stain, polished slab from I-696, constructed 1995, away from transverse joint, top half of core D, MTU ID 696-12.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, away from transverse joint, top half of core D, MTU ID 696-12.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, away from transverse joint, bottom half of core D, MTU ID 696-12.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, away from transverse joint, bottom half of core D, MTU ID 696-12.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, away from transverse joint, bottom half of core D, MTU ID 696-12.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, away from transverse joint, bottom half of core D, MTU ID 696-12.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, away from transverse joint, bottom half of core D, MTU ID 696-12.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, away from transverse joint, bottom half of core D, MTU ID 696-12.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltin nitrite stain, polished slab from I-696, constructed 1995, away from transverse joint, bottom half of core D, MTU ID 696-12.
Alkali silica reaction in fine aggregate and associated cracking, before and after sodium cobaltinitrite stain, polished slab from I-696, constructed 1995, away from transverse joint, bottom half of core D, MTU ID 696-12.
Example of chert particle exhibiting alkali-silica reaction without any associated cracking, from thin section prepared from core from I-696, constructed 1978, at transverse joint, MTU ID 696-07. From top to bottom: transmitted light, crossed-polars, and epifluorescent mode images.
Example of chert particle exhibiting alkali-silica reaction with minor cracking within particle, from thin section prepared from core from I-696, constructed 1978, at transverse joint, MTU ID 696-07. From top to bottom: transmitted light, crossed-polars, and epifluorescent mode images.
Example of chert particle exhibiting deleterious alkali-silica reaction, from thin section prepared from core from I-696, constructed 1995, away from transverse joint, MTU ID 696-03. From top to bottom: transmitted light, crossed-polars, and epifluorescent mode images.
Example of chert particle exhibiting deleterious alkali-silica reaction, from thin section prepared from core from I-696, constructed 1995, away from transverse joint, MTU ID 696-03. From top to bottom: transmitted light, crossed-polars, and epifluorescent mode images.
Example of chert particle exhibiting deleterious alkali-silica reaction, from thin section prepared from core from I-696, constructed 1995, away from transverse joint, MTU ID 696-03. From top to bottom: transmitted light, crossed-polars, and epifluorescent mode images.
Example of chert particle exhibiting deleterious alkali-silica reaction, from thin section prepared from core from I-696, constructed 1995, away from transverse joint, MTU ID 696-03. From top to bottom: transmitted light, crossed-polars, and epifluorescent mode images.
Example secondary ettringite in entrained air voids, from thin section prepared from core from I-696, constructed 1995, away from transverse joint, MTU ID 696-03. From top to bottom: transmitted light, crossed-polars, and epifluorescent mode images.
Example of chert particle exhibiting deleterious alkali-silica reaction, from thin section prepared from core from I-696, constructed 1995, away from transverse joint, MTU ID 696-12. From top to bottom: transmitted light, crossed-polars, and epifluorescent mode images.
Epifluorescent mode (left) and transmitted light (right) images at transition between zone of abundant entrained air and zone without entrained air at a depth of approximately 3 inches (75 mm). Example from thin section prepared from core taken from I-696, outside lane, away from joint, MTU ID 696-03.
Mosaic of 12 epifluorescent mode images collected from thin sections prepared from core from I-696, constructed 1978, away from transverse joint, MTU ID 696-01 (each individual frame measures 2.612 x 1.959 mm).
Mosaic of 12 epifluorescent mode images collected from thin sections prepared from core from I-696, constructed 1978, away from transverse joint, MTU ID 696-01, after masking out air voids and fine aggregate to isolate cement paste (each individual frame measures 2.612 x 1.959 mm).
Average cement paste pixel intensities per frame, and equivalent w/c values (as compared to 28-day moist cured mortar samples) from thin section prepared from core from I-696, constructed 1978, away from transverse joint, MTU ID 696-01.

<table>
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<th>cement paste pixel fluorescence measurements (average intensity per frame)</th>
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<th>equivalent w/c ((y = 0.0044x + 0.0329))</th>
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Mosaic of 12 epifluorescent mode images collected from thin sections prepared from core from I-696, constructed 1995, away from transverse joint, MTU ID 696-08 (each individual frame measures 2.612 x 1.959 mm).
Mosaic of 12 epifluorescent mode images collected from thin sections prepared from core from I-696, constructed 1995, away from transverse joint, MTU ID 696-08, after masking out air voids and fine aggregate to isolate cement paste (each individual frame measures 2.612 x 1.959 mm).
Average cement paste pixel intensities per frame, and equivalent w/c values (as compared to 28-day moist cured mortar samples) from thin section prepared from core from I-696, constructed 1995, away from transverse joint, MTU ID 696-08.

| cement paste pixel fluorescence measurements (average intensity per frame) |
|-----------------------------|----------------|----------------|----------------|
| 75                          | 83             | 80             | 78             |
| 81                          | 75             | 82             | 75             |
| 73                          | 75             | 75             | 84             |

Equivalent w/c \( (y = 0.0044x + 0.0329) \)

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Mosaic of 12 epifluorescent mode images collected from thin sections prepared from core from I-696, constructed 1995, away from transverse joint, MTU ID 696-11 (each individual frame measures 2.612 x 1.959 mm).
Mosaic of 12 epifluorescent mode images collected from thin sections prepared from core from I-696, constructed 1995, away from transverse joint, MTU ID 696-11, after masking out air voids and fine aggregate to isolate cement paste (each individual frame measures 2.612 x 1.959 mm).
Appendix A
I-696 Core Site

Average cement paste pixel intensities per frame, and equivalent w/c values (as compared to 28-day moist cured mortar samples) from thin section prepared from core from I-696, constructed 1995, away from transverse joint, MTU ID 696-11.

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