Mix Designs, Trial Batches & PCCP Production

501 QC/QA PCCP

502 Non-QC/QA PCCP

506 Patching PCCP

QC/QA PCCP

- Section 501 of Standard Specifications
  - RSP in Contracts let on or after Feb 2009
    - Revisions to mix design and trial batch
  - Prior lettings allowed thru CO
    - See Construction Memo 09-06
    - Entitled “PCCP Cost Savings Measures”
  - Otherwise Section 501.04 & .05 in 2008 Book

CMDS for QC/QA PCCP

- Concrete Mix Design Submittal
  - Prepared By Contr. on Department Spreadsheet
  - Specific information
    - Plant & Contract
    - Specification Reference
    - Materials
    - Proportioning
    - Targets for UW, W/C and Fine to Total Agg Ratio
  - Submitted to, and Approved by DTE
    - Ready for Trial Batch Only
    - (not approved for **P**roduction)

INDOT CONCRETE MIX DESIGN SPREADSHEET FOR ENGLISH CONTRACTS

MIX PRODUCER	imi Southwest, Inc.	CONTRACT NO.	IR-29384
PRODUCT ID	1455	INDOT DISTRICT	Vincennes
PLANT LOCATION	Lloyd Expressway - Evansville		
INDOT PLANT NO.	1494	SUBMITTAL STAGE	CMDS

INDOT CMD NO.	**086501011S**	SPEC. REFERENCE	**501**

FINE & COARSE AGGREGATE MATERIALS

Q#	Source Code	PRODUCER NAME	SIZE	TYPE	QUAL	LEDGES
Q972021	2621	zer Crushed Stone, Evansville Redist(Cape Sar	#8	CS	AP	804-812
Q972021	2632	ılzer Crushed Stone, Evansville Redist(Evansvi	#23	NS		

**% passing No. 200 sieve , CA contributes 1.6% , FA contributes 0.3%

CEMENT & POZZOLAN MATERIALS

W#	MANUFACTURER / LOCATION	PLANT or PRODUCT	DESCRIPTION
W028367	Lehigh Portland Cement Co.	Mitchell, IN.	Type I Cement

WATER
SOURCE
pub. utility
QUALITY

AIR ENTRAINING AGENT, CHEMICAL ADMIXTURES & CALCIUM CHLORIDE SOLUTION

W#	MANUFACTURER	PRODUCT NAME	TYPE	DOSAGE RANGE oz/cwt
W028619	W.R. Grace & Co.	Darex II AEA	AEA	0.50 to 5.0
W028645	W.R.Grace & Co.	Daracem 55	A	3.0-9.0

BATCH PARAMETERS

MATERIAL	WEIGHT lbs	SP GR or Bulk (ssd)	AGG. ABS. %	VOLUME ft³
Cement	564	3.150		2.87
Fly Ash				0.00
GGBFS				0.00
				0.00
FA	1262	2.584	1.34	7.83
CA 1	1778	2.629	2.22	10.84
CA 2				0.00
water	230.9	1.000		3.70
air	0	0.000		1.76
?	3835			27.00
			Yield Results:	**Correct**

SPECIFICATION PARAMETERS

Cement/Fly Ash Ratio, by wt	
Cement/GGBFS Ratio, by wt	
Cement Reduction, %	
Fly Ash Replacement Ratio	
GGBFS Replacement Ratio	
Cement Multiplier	
Fly Ash Addition, %	
GGBFS Addition, %	
Silica Fume Content, %	
Target W/(C+P), by wt	0.409
Target Unit Weight, pcf	142.0
FA to total Agg, % by wt	42
FA to total Agg, % by vol	
*** % Passing 1 inch sieve	100
** % Passing No. 200 sieve	1.1

DISTRIBUTION AFTER APPROVAL:

Project Engineer
Contractor
Mix Producer
District Testing File

NAME: Mike Collins DATE: 7/23/2008

REPRESENTATIVE OF CONTRACTOR OR MIX PRODUCER

DTE SIGNATURE: Mark Fligor /AFT DATE: 7/26/2008

Producer Comments: For slip form work. Back up plant is #1532 Oak Grove Rd. Evansville
Same source for all raw materials, different distribution yard for aggregates.

DTE Notes: Concrete can not come from plant #1532 unless it has another approved INDOT CMD NO.

v4cmdstp

CMDS for QC/QA PCCP

- Critical Elements for PE/PS Review
  - Contract No.
  - Submittal Stage (CMDS)
  - Specification Reference, 501
  - INDOT CMD No. with S suffix letter
  - Signed by DTE
  - DTE Notes or comments

INDOT CONCRETE MIX DESIGN SPREADSHEET FOR ENGLISH CONTRACTS

MIX PRODUCER	imi Southwest, Inc.	CONTRACT NO.	IR-29384
PRODUCT ID	1455	INDOT DISTRICT	Vincennes
PLANT LOCATION	Lloyd Expressway - Evansville		
INDOT PLANT NO.	1494	SUBMITTAL STAGE	CMDS

INDOT CMD NO.	**086501011S**	SPEC. REFERENCE	**501**

FINE & COARSE AGGREGATE MATERIALS

Q#	Source Code	PRODUCER NAME	SIZE	TYPE	QUAL	LEDGES
Q972021	2621	zer Crushed Stone, Evansville Redist(Cape Sar	#8	CS	AP	804-812
Q972021	2632	ulzer Crushed Stone, Evansville Redist(Evansvil	#23	NS		

**% passing No. 200 sieve , CA contributes 1.6% , FA contributes 0.3%

CEMENT & POZZOLAN MATERIALS

W#	MANUFACTURER / LOCATION	PLANT or PRODUCT	DESCRIPTION
W028367	Lehigh Portland Cement Co.	Mitchell, IN.	Type I Cement

WATER
SOURCE
pub. utility
QUALITY

AIR ENTRAINING AGENT, CHEMICAL ADMIXTURES & CALCIUM CHLORIDE SOLUTION

W#	MANUFACTURER	PRODUCT NAME	TYPE	DOSAGE RANGE oz/cwt
W028619	W.R. Grace & Co.	Darex II AEA	AEA	0.50 to 5.0
W028645	W.R.Grace & Co.	Daracem 55	A	3.0-9.0

BATCH PARAMETERS

MATERIAL	WEIGHT lbs	SP GR or Bulk (ssd)	AGG. ABS. %	VOLUME ft³
Cement	564	3.150		2.87
Fly Ash				0.00

SPECIFICATION PARAMETERS

Cement/Fly Ash Ratio, by wt	
Cement/GGBFS Ratio, by wt	
Cement Reduction, %	
Fly Ash Replacement Ratio	

BATCH PARAMETERS				
MATERIAL	WEIGHT lbs	SP GR or Bulk (ssd)	AGG. ABS. %	VOLUME ft^3
Cement	564	3.150		2.87
Fly Ash				0.00
GGBFS				0.00
				0.00
FA	1262	2.584	1.34	7.83
CA 1	1778	2.629	2.22	10.84
CA 2				0.00
water	230.9	1.000		3.70
air	0	0.000		1.76
?	3835			27.00
			Yield Results:	**Correct**

SPECIFICATION PARAMETERS	
Cement/Fly Ash Ratio, by wt	
Cement/GGBFS Ratio, by wt	
Cement Reduction, %	
Fly Ash Replacement Ratio	
GGBFS Replacement Ratio	
Cement Multiplier	
Fly Ash Addition, %	
GGBFS Addition, %	
Silica Fume Content, %	
Target W/(C+P), by wt	0.409
Target Unit Weight, pcf	142.0
FA to total Agg, % by wt	42
FA to total Agg, % by vol	
*** % Passing 1 inch sieve	100
** % Passing No. 200 sieve	1.1

DISTRIBUTION AFTER APPROVAL:

Project Engineer

Contractor

Mix Producer

District Testing File

NAME: Mike Collins DATE: 7/23/2008

REPRESENTATIVE OF CONTRACTOR OR MIX PRODUCER

DTE SIGNATURE: Mark Fligor /AET DATE: 7/26/2008

Producer Comments: For slip form work. Back up plant is #1532 Oak Grove Rd. Evansville Same source for all raw materials, different distribution yard for aggregates.

DTE Notes: Concrete can not come from plant #1532 unless it has another approved INDOT CMD NO.

v4cmdstp

Trial Batch For QC/QA PCCP

- Rely on DTE for Instruction/Guidance/HELP!
- Details in Special Provision in CIB
  - Trial Batch Not Required in all cases
    - Cement content 564 pcy & Design W/C ≤ 0.420
    - Class C per 702 using AP Quality CA
  - Trial Batch Required for Most Cases
    - Purpose
    - Preparation
    - Procedure

Purpose of Trial Batch

- Validate Concrete Properties
- QC & Acceptance Testing Comparison
- Baseline Properties Of CMD
- Confirm Targets for UW and W/C
  - Part of Acceptance Testing (see 501.27)
- View Plant Process to understand QC needs
  - Part of QCP as defined in ITM 803
    - Trial Batch Demonstration (section 6.6)
    - Concrete Batching (section 6.7)

Preparation For Trial Batch

- CMDS Approved by DTE
- Certified Tech & Qualified Inspector Present
- Allow Adequate Time
- Test Equipment and Molds
  - W/C
  - Unit Weight
  - Air Content
  - Beams for 7-day Flexural Strength
- Demonstration not Experimentation

Procedure for Trial Batch

- 501.06 of Standard Specifications
  - Plant, prior to production
  - Lab, prior to production (ASTM C 192)
- Two page Worksheet
  - Part of Workbook with CMDS
  - Provides systematic approach
  - Promotes success
- Start With Aggregate Properties
  - Sample and test aggregate moistures for W/C
  - Bulk Sp. Gr. and absorption stated in CMDS

TRIAL BATCH QC/QA PCCP per 501.06

Date: 8/12/2008 Plant No. 1494 Location: Ohio St; Evansville, IN
Batching & Mixing Equipment:
INDOT CMD No. **086501011S**
Name(s) of Contractor's Certified Technician and ACI Grade 1 Certification Number: John Summers (IMI), Larry Brown and Micah Meives (E&B).
Name(s) of INDOT Qualified Technician & Submitter Nos. Brandon Deputy

AGGREGATE TEST RESULTS

Properties	Contractor Result	Last Name of ACI Certified Technician	INDOT Result	Last Name of INDOT Qual. Technician
FA Bulk Sp. Gr. (SSD)	2.584	Lingerfelt	NA	NA
FA Absorption, %	1.34	Lingerfelt	NA	NA
FA Moisture, %	3.67	Average	3.51	Deputy
CA Bulk Sp. Gr. (SSD)	2.629	Lingerfelt	NA	NA
CA Absorption, %	2.22	Lingerfelt	NA	NA
CA Moisture, %	2.54	Average	2.53	Deputy
Agg. Correction Factor			0.2	Irvin

CONCRETE BATCHING

Materials	Design Batch Weights (SSD Aggregate) lbs	Target Batch Weights (Moist Aggregates) lbs	Target Batch Size yd³	Total Target Batch Weights lbs	Actual Batch Weights lbs	Batching Error ± %	Allowable Error ± %
Cement	564	564	4.0000	2256.00	2260.00	0.18	±1.49
Fly Ash	0	0	4.0000	0.00			±1.49
GGBFS	0	0	4.0000	0.00			±1.49
FA	1262	1291	4.0000	5165.62	5160.00	-0.11	±2.49
CA	1778	1784	4.0000	7134.76	7180.00	0.63	±2.49
Water	231	196	4.0000	783.22	772.00	-1.43	±1.49
Σ	3835	3835	NA	15339.60	15372.00	NA	NA

ADMIXTURE DOSAGE

Admixture Name	Target Dosage fl oz/cwt	Total Req. Dosage fl oz	Actual Dosage fl oz	Batching Error ± %	Allowable Error ± %
Darex II AEA	1.60	36.096	36	-0.3	±3.49
Daracem 55	3.00	67.68	68	0.5	±3.49
0		0			±3.49

Comments on Batching: Carla (IA) Results- FA- 3.86%. CA- 2.69%.
John Summers Results- FA- 3.63%. CA- 2.40%.
Probe-3.70%.
Moisture Cookouts for Contractor are an average of State and Summers results.

v4cmdstp

PLASTIC CONCRETE TEST RESULTS, 501.06

Plastic Property **086501011S**	Contractor Certifed Technician Results	Last Name of ACI Certified Technician	INDOT Qualified Technician Results	Last Name of INDOT Qualified Technician
Water/Cementious	0.403	Summers	0.399	Deputy
Unit Wt. (pcf)	143.3	Brown	144.0	Deputy
Air Content (%)	5.9	Brown	5.7	Deputy
Slump (inches)	2.25	Meives	1.75	Deputy
Relative Yield	0.993	Brown	0.988	Deputy

FLEXURAL STRENGTH TEST RESULTS, 501.06

Age In Days	Contractor's Lab Result psi Specimen	Contractor's Lab Result psi Average	Last Name of Contractor Technician	INDOT Qualified Techician Result psi Specimen	INDOT Qualified Techician Result psi Average	Last Name of INDOT Qualified Technician
		#DIV/0!			#DIV/0!	
7	658		Brown	666		Deputy
7	626	642	Brown	620	643	Deputy

Comments on Test Results: Carla- Slump 1.75". Air=5.7% UW= 144.4 Ry=0.986
John Sommers- Slump=2". Air=5.8%. UW= 142.9 Ry=0.996; Carla's Ry is only one that is low for measured air content, all others as expected for measured air content.

Test Results From First Annual Production Lot of CMDT, 501.04

Properties	Contractor QC Results Sublot 1	Contractor QC Results Sublot 2	Contractor QC Results Sublot 3	INDOT Acceptance Results Sublot 1	INDOT Acceptance Results Sublot 2	INDOT Acceptance Results Sublot 3
Water/Cementitious Ratio	0.405	0.405	0.423	0.405	0.405	0.423
Unit Weight, pcf	144.6	143.6	144.1	144.7	143.7	144.1
Air Content, %	6.2	6.8	6.4	6.2	6.8	6.4
Relative Yield	0.988	0.993	0.991	0.987	0.992	0.989
Ave 7-day Flex Strength, psi	658	651	682	667	611	633

Comments on Results: AZ question INDOT W/C results matching exactly to Contractor's values.
INDOT and Contractor Ry's are low for measured air contents. Underyielding in Sublot 3 does not support W/C being higher than target.

INDOT Acceptance Test Results
First Changes per 501.04(b)

Properties	First Sublot
Water/Cementitious Ratio	
Unit Weight, pcf	
Air Content, %	
Relative Yield	
Ave 7-day Flex Strength, psi	

Comments on Results:

INDOT Acceptance Test Results
Second Changes per 501.04(b)

Properties	First Sublot
Water/Cementitious Ratio	
Unit Weight, pcf	
Air Content, %	
Relative Yield	
Ave 7-day Flex Strength, psi	

Comments on Results:

v4cmdstp

CMDP for QC/QA PCCP

- Concrete Mix Design Production
  - Must have successful trial batch
  - Prepared on Department Spreadsheet
  - Submitted to DTE for Review and Approval

CMDP for QC/QA PCCP

Critical Elements for PE/PS Review

- Contract No.
- Submittal Stage, CMDP
- Specification Reference, 501
- INDOT CMD No. with **P** suffix letter
- Final Targets for UW, W/C & % Fine / Total Agg
- Signed by DTE
- DTE Notes

INDOT CONCRETE MIX DESIGN SPREADSHEET FOR ENGLISH CONTRACTS

MIX PRODUCER	imi Southwest, Inc.	CONTRACT NO.	IR-29384
PRODUCT ID	1455	INDOT DISTRICT	Vincennes
PLANT LOCATION	Lloyd Expressway - Evansville		
INDOT PLANT NO.	1494	SUBMITTAL STAGE	CMDP

INDOT CMD NO.	**086501011P**	SPEC. REFERENCE	**501**

FINE & COARSE AGGREGATE MATERIALS

Q#	Source Code	PRODUCER NAME	SIZE	TYPE	QUAL	LEDGES
Q972021	2621	zer Crushed Stone, Evansville Redist(Cape Sar	#8	CS	AP	804-812
Q972021	2632	ulzer Crushed Stone, Evansville Redist(Evansvil	#23	NS		

**% passing No. 200 sieve , CA contributes 1.6% , FA contributes 0.3%

CEMENT & POZZOLAN MATERIALS

W#	MANUFACTURER / LOCATION	PLANT or PRODUCT	DESCRIPTION
W028367	Lehigh Portland Cement Co.	Mitchell, IN.	Type I Cement

WATER
SOURCE
pub. utility
QUALITY

AIR ENTRAINING AGENT, CHEMICAL ADMIXTURES & CALCIUM CHLORIDE SOLUTION

W#	MANUFACTURER	PRODUCT NAME	TYPE	DOSAGE RANGE oz/cwt
W028619	W.R. Grace & Co.	Darex II AEA	AEA	0.50 to 5.0
W028645	W.R.Grace & Co.	Daracem 55	A	3.0-9.0

BATCH PARAMETERS

MATERIAL	WEIGHT lbs	SP GR or Bulk (ssd)	AGG. ABS. %	VOLUME ft³
Cement	564	3.150		2.87
Fly Ash				0.00

SPECIFICATION PARAMETERS

Cement/Fly Ash Ratio, by wt	
Cement/GGBFS Ratio, by wt	
Cement Reduction, %	
Fly Ash Replacement Ratio	

BATCH PARAMETERS				
MATERIAL	WEIGHT lbs	SP GR or Bulk (ssd)	AGG. ABS. %	VOLUME ft^3
Cement	564	3.150		2.87
Fly Ash				0.00
GGBFS				0.00
				0.00
FA	1262	2.584	1.34	7.83
CA 1	1778	2.629	2.22	10.84
CA 2				0.00
water	230.9	1.000		3.70
air	0	0.000		1.76
?	3835			27.00
			Yield Results:	**Correct**

SPECIFICATION PARAMETERS	
Cement/Fly Ash Ratio, by wt	
Cement/GGBFS Ratio, by wt	
Cement Reduction, %	
Fly Ash Replacement Ratio	
GGBFS Replacement Ratio	
Cement Multiplier	
Fly Ash Addition, %	
GGBFS Addition, %	
Silica Fume Content, %	
Target W/(C+P), by wt	0.409
Target Unit Weight, pcf	142.0
FA to total Agg, % by wt	42
FA to total Agg, % by vol	
*** % Passing 1 inch sieve	100
** % Passing No. 200 sieve	1.1

DISTRIBUTION AFTER APPROVAL:

Project Engineer

Contractor

Mix Producer

District Testing File

NAME: Mike Collins DATE: 10/27/2008

REPRESENTATIVE OF CONTRACTOR OR MIX PRODUCER

DTE SIGNATURE: Mark Fligor /AET DATE: 10/27/2008

Producer Comments: For slip form work. Back up plant is #1532 Oak Grove Rd. Evansville Same source for all raw materials, different distribution yard for aggregates.

DTE Notes: Concrete can not come from plant #1532 unless it has another approved INDOT CMD NO.

CMDP Flexibility (500-R-559)

- For Existing CMDP
  - Change in Materials
  - Adjustments to Materials
  - Other Adjustments

Change in Materials, 501.04(a)

- Requires new CMDS with changes
- Requires Trial Batch or Verification
  - Trial Batch prior to production
    - at plant
    - in Lab
  - Verification during first day of production
- Requires new CMDP

Adjustments to Materials, 501.04(b)

- Requires new CMDS with adjustments
- Does Not Require new Trial Batch or Verification
- Requires new CMDP

Other Adjustments, 501.04(c)

- Other Adjustments:
  - Admixture dosage rates
  - Fine to Total Aggregate Ratio, ± 3 %
- Does Not Require new CMDS
- Does Not Require DTE Notification

Non-QC/QA PCCP

- Section 502 of Standard Specifications
  - Contracts let on or after February 2009 have RSP
    - no major changes, only clarification
  - CMDS submitted by Contractor or Mix Producer
  - Trial Batch only required for High-Early Strength
  - DTE reviews and processes
  - CMDP issued
- Critical Elements for PE/PS review

INDOT CONCRETE MIX DESIGN SPREADSHEET FOR ENGLISH CONTRACTS

MIX PRODUCER	imi Southwest, Inc.	CONTRACT NO.	RS-29868-A
PRODUCT ID	7000	INDOT DISTRICT	Vincennes
PLANT LOCATION	Lloyd Expressway - Evansville		
INDOT PLANT NO.	1494	SUBMITTAL STAGE	CMDP

INDOT CMD NO.	**096502001P**	SPEC. REFERENCE	**502 Standard Strength**

FINE & COARSE AGGREGATE MATERIALS

Q#	Source Code	PRODUCER NAME	SIZE	TYPE	QUAL	LEDGES
Q972021	2621	Mulzer Crushed Stone, Evansville Redist(Cape Sandy)	#8	CS	AP	603-610
Q972021	2632	Mulzer Crushed Stone, Evansville Redist(Evansville)	#23	NS		

CEMENT & POZZOLAN MATERIALS

W#	MANUFACTURER / LOCATION	PLANT or PRODUCT	DESCRIPTION
W028367	Lehigh Portland Cement Co.	Mitchell, IN.	Type I Cement
W028160	Mineral Resource Technologies, Inc.	Petersburg, IN	Class F Fly Ash

WATER
SOURCE
pub. utility
QUALITY
potable

AIR ENTRAINING AGENT, CHEMICAL ADMIXTURES & CALCIUM CHLORIDE SOLUTION

W#	MANUFACTURER	PRODUCT NAME	TYPE	DOSAGE RANGE oz/cwt
W028619	W.R. Grace & Co.	Darex II AEA	AEA	0.50 to 5.0
W028645	W.R.Grace & Co.	Daracem 55	A	3.0-9.0

BATCH PARAMETERS

MATERIAL	WEIGHT lbs	SP GR or Bulk (ssd)	AGG. ABS. %	VOLUME ft³
Cement	479	3.150		2.44
Fly Ash	106	2.530		0.67

SPECIFICATION PARAMETERS

Cement/Fly Ash Ratio, by wt	
Cement/GGBFS Ratio, by wt	
Cement Reduction, %	15
Fly Ash Replacement Ratio	1.25 :1

BATCH PARAMETERS				
MATERIAL	WEIGHT lbs	SP GR or Bulk (ssd)	AGG. ABS. %	VOLUME ft³
Cement	479	3.150		2.44
Fly Ash	106	2.530		0.67
GGBFS				0.00
				0.00
FA	1164	2.584	1.34	7.22
CA 1	1795	2.654	1.42	10.84
CA 2				0.00
water	254.0	1.000		4.07
air	0	0.000		1.76
?	3798			27.00
			Yield Results:	**Correct**

SPECIFICATION PARAMETERS	
Cement/Fly Ash Ratio, by wt	
Cement/GGBFS Ratio, by wt	
Cement Reduction, %	15
Fly Ash Replacement Ratio	1.25 :1
GGBFS Replacement Ratio	
Cement Multiplier	
Fly Ash Addition, %	
GGBFS Addition, %	
Silica Fume Content, %	
Target W/(C+P), by wt	0.434
Target Unit Weight, pcf	140.7
FA to total Agg, % by wt	39
FA to total Agg, % by vol	
% Passing 1 inch sieve	
% Passing No. 200 sieve	

DISTRIBUTION AFTER APPROVAL:

Project Engineer

Contractor

Mix Producer

District Testing File

NAME: Mike Collins DATE: 1/19/2009

REPRESENTATIVE OF CONTRACTOR OR MIX PRODUCER

DTE SIGNATURE: Mark Fligor /AFT DATE: 1/26/2009

Producer Comments:

DTE Notes: sent to AZ for processing on 1/26/09

v4cmdstp

Patching PCCP

- Section 506 of Standard Specifications
  - Contracts let on or after February 2009
    - RSP in CIB identifies revisions to 506.03
  - Prior lettings allow CO
    - See Construction Memo 09-06
  - Otherwise Section 506.03 & .05 of 2008 Book

CMDS For Patching PCCP

- Critical Elements for PE/PS Review
  - Contract No.
  - Submittal Stage (CMDS, ready for trial batch)
  - Specification Reference, 506 Full or Partial
  - INDOT CMD No. with **S** suffix letter
  - Signed by DTE
  - DTE Notes

Trial Batch For Patching PCCP

- Rely on DTE for Instruction/Guidance/HELP!
- Details in CIB Special Provision
  - When a Trial Batch is Required
    - Purpose
    - Preparation
    - Procedure
  - When a Trial Batch is Not Required
    - Quantity of Partial Depth < 10 cyd
    - Quantity of Full Depth < 10 cyd

CMDP for Patching PCCP

- CMDP Must have successful trial batch
- Submitted by Contractor or mix producer to DTE
- Prepared on Department Spreadsheet
- Critical Elements for PE/PS Review
  - Contract No.
  - Submittal Stage, CMDP
  - Specification Reference, 506 Full or Partial Depth
  - INDOT CMD No. with **P** suffix letter
  - Signed by DTE
  - DTE Notes

INDOT CONCRETE MIX DESIGN SPREADSHEET FOR ENGLISH CONTRACTS

MIX PRODUCER	imi Southwest, Inc.	CONTRACT NO.	IR-29384
PRODUCT ID	1453	INDOT DISTRICT	Vincennes
PLANT LOCATION	Lloyd Expressway - Evansville		
INDOT PLANT NO.	1494	SUBMITTAL STAGE	CMDP
INDOT CMD NO.	**086506004P**	SPEC. REFERENCE	**506 Full Depth**

FINE & COARSE AGGREGATE MATERIALS

Q#	Source Code	PRODUCER NAME	SIZE	TYPE	QUAL	LEDGES
Q972021	2621	Mulzer Crushed Stone, Evansville Redist(Cape Sandy)	#8	CS	AP	804-812
Q972021	2632	Mulzer Crushed Stone, Evansville Redist(Evansville)	#23	NS		

CEMENT & POZZOLAN MATERIALS

W#	MANUFACTURER / LOCATION	PLANT or PRODUCT	DESCRIPTION
W028367	Lehigh Portland Cement Co.	Mitchell, IN.	Type I Cement

WATER
SOURCE
pub. utility
QUALITY
potable

AIR ENTRAINING AGENT, CHEMICAL ADMIXTURES & CALCIUM CHLORIDE SOLUTION

W#	MANUFACTURER	PRODUCT NAME	TYPE	DOSAGE RANGE oz/cwt
W028619	W.R. Grace & Co.	Darex II AEA	AEA	0.50 to 5.0
W028645	W.R.Grace & Co.	Daracem 55	A	3.0-9.0
	Dow Chemical Company	Liquidow Calcium Chloride	CaCl Typ L	32.3 - 64.4

concentration of CaCl Type L is 29.0% solution density is 10.69 lbs /gal water portion is 7.59 lbs/gal

BATCH PARAMETERS

MATERIAL	WEIGHT lbs	SP GR or Bulk (ssd)	AGG. ABS. %	VOLUME ft³
Cement	658	3.150		3.35
Fly Ash				0.00

SPECIFICATION PARAMETERS

Cement/Fly Ash Ratio, by wt	
Cement/GGBFS Ratio, by wt	
Cement Reduction, %	
Fly Ash Replacement Ratio	

	Dow Chemical Company	Liquidow Calcium Chloride	CaCl Typ L	32.3 - 64.4

concentration of CaCl Type L is 29.0% solution density is 10.69 lbs /gal water portion is 7.59 lbs/gal

BATCH PARAMETERS				
MATERIAL	WEIGHT lbs	SP GR or Bulk (ssd)	AGG. ABS. %	VOLUME ft³
Cement	658	3.150		3.35
Fly Ash				0.00
GGBFS				0.00
				0.00
FA	1124	2.584	1.34	6.97
CA 1	1740	2.629	2.22	10.61
CA 2				0.00
water	269.0	1.000		4.31
air	0	0.000		1.76
?	3791			27.00
			Yield Results:	**Correct**

SPECIFICATION PARAMETERS	
Cement/Fly Ash Ratio, by wt	
Cement/GGBFS Ratio, by wt	
Cement Reduction, %	
Fly Ash Replacement Ratio	
GGBFS Replacement Ratio	
Cement Multiplier	
Fly Ash Addition, %	
GGBFS Addition, %	
Silica Fume Content, %	
Target W/(C+P), by wt	0.409
Target Unit Weight, pcf	140.4
FA to total Agg, % by wt	39
FA to total Agg, % by vol	
% Passing 1 inch sieve	
% Passing No. 200 sieve	

DISTRIBUTION AFTER APPROVAL:

Project Engineer

Contractor

Mix Producer

District Testing File

NAME: Mike Collins DATE: 5/30/2008

REPRESENTATIVE OF CONTRACTOR OR MIX PRODUCER

DTE SIGNATURE: Mark Fligor /ART DATE: 6/18/2008

Producer Comments: MC requesting to use INDOT CMD# 076506003P for IR-29384. CMD #076506003P is metric; this mix converted to standard units with updated Sp. Gr. and absorption. CaCl Type L added on job. 1% = 1.65 gal/cyd of solution (contributes 12.6 lbs water/cyd); 2% = 3.31gal/cyd (contributes 25.1 lbs water/cyd).

DTE Notes: **506.03 only allows this mix to be used in 2008 construction season w/ DTE approval.** CMDP 076506003P was also transferred over to RS-28668 via 086506002P on 5/14/08

v4cmdstp

CMDP Flexibility (500-R-559)

- For Existing CMDP Patching
  - Change in Materials
  - Adjustments to Materials
  - Other Adjustments

Change in Materials, 506.03(a)

- Requires new CMDS with changes
- Requires new Trial Batch or Verification
  - Trial Batch at plant prior to production
  - Verification during first day of production
- Requires new CMDP

Adjustments to Materials, 506.03(b)

- Requires new CMDS with adjustments
- Does Not Require new Trial Batch or Verification
- Requires new CMDP

Other Adjustments to Materials, 506.03(c)

- Other Adjustments:
  - Admixture dosage rates
  - Fine to Total Aggregate Ratio, ± 3 %
- Does Not Require new CMDS
- Does Not Require DTE Notification

PE/PS Workshop

Session #9

Portland Cement Concrete Paving

February 26, 2009

PE/PS Workshop

PE/PS Workshop

- The Quality Control Plan
  - ITM 803
  - Authority/obligation to shut ‘er down
  - Things to look for
    - Qualified QC Technician for Contractor
    - Contingency plans for troubleshooting mix
    - What if ???

PE/PS Workshop

- Subbase Prep.
  - Generally 6 and 3
  - Baby the 8's
  - Watch the Underdrains
  - Drainage!

Forming/String-lining

Forming

- Forms:
  - Tolerances
  - Smoothness!
  - Oil (especially wood)
  - Clean ‘em once in a while!

Slipforming

- Plenty of stakes and plenty of tension
- Check it, check it again (contractor)
- Periodic depth and width checks

Joint Materials

Joint Materials

Joint Materials

- Joints matter huge!
- Same plane as slab
- Cut wires and oil dowels
- Pin ‘em down!
- One piece as often as possible

Joint Materials

Joint Materials

The Paving Train

- Specifically for Slipforming
- Breakdown – vibration, tie bar insertion
- Finish – final shape, tie bars for next pour
- Straight edging and floating
- Micro and macrotexture
- Curing

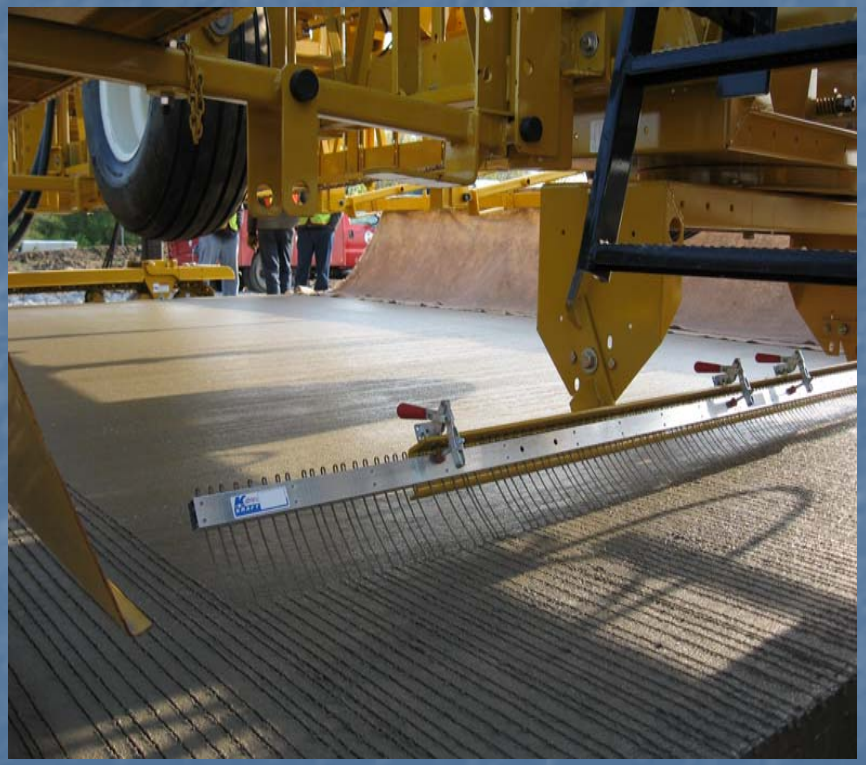
The Paving Train

The Paving Train

The Paving Train

The Paving Train

The Paving Train



Curing

- Typically with white pigment cure
  - Quickly after tining
  - Good coverage, even sides
  - Repair after sawing
- Other Methods
- Same for test specimens

Joint Sawing

Strength Gain Monitoring With Maturity Meter

Smoothness

- Still with a profilograph (for now)
- 501.25 for methodology and locations
- Irregular sections: straight edge
- Long Patches

Acceptance Testing

- Run Tests in accordance with ITM's
- See 501.28 for Pay Factor determination
- Generally, looking for 100% pay
  - Exceptions: smoothness…up to 6% above
  - Thickness…up to 5% above
    - Controversy
    - Measure yourself, before submission


70 EAST
EXIT 89
465
Shadeland Ave.
1/4 MILE
RIGHT LANE
GOMACO
GHP2800

Questions?

SECTION 506 – PCCP PATCHING

Prepared by Dan Streib

Concrete Mix Designs

- Concrete Mix Design Submittal (CMDS) must be submitted to the DMTE a minimum of 7 calendar days prior to the trial batch utilizing the Department provided spreadsheet
- Once approved the Concrete Mix Design Submittal (CMDS) will be used by the PE/PS & contractor to conduct the trial batch. Trial batch results will be used by the DMTE in order to approve the CMDS and designated the mix as a CMDP ready for production.
- A new CMDS along with a new Trial Batch will be needed for every change in material or change in source.

Trial Batches

- Trial batches will verify.
  - Minimum portland cement content 658 lbs/cy3
  - Maximum water/cement ratio 0.45
  - Minimum slump.....2 in. (50 mm)
  - Air Content.....6.5% ± 1.5%
  - Minimum Flexural strength, third point loading..... 300 psi (2100 kPa) at 24 h
  - Minimum flexural strength, third point loading..... 500 psi (3500 kPa) at 3 days

- When calcium chloride solution is added, a maximum of 2%, by weight (mass) of cement, shall be used, so remember to account for calcium usage in the trial batch and verify calcium weights with your DMTE.

Job Control

- Air Content
  - Air test on the 1st load of the day & once every 50 cyds there after.
- Flexural Strength
  - Once per every 150 cyds & tested for 3 day strength requirements.

Patch Selection

PCCP REMOVAL

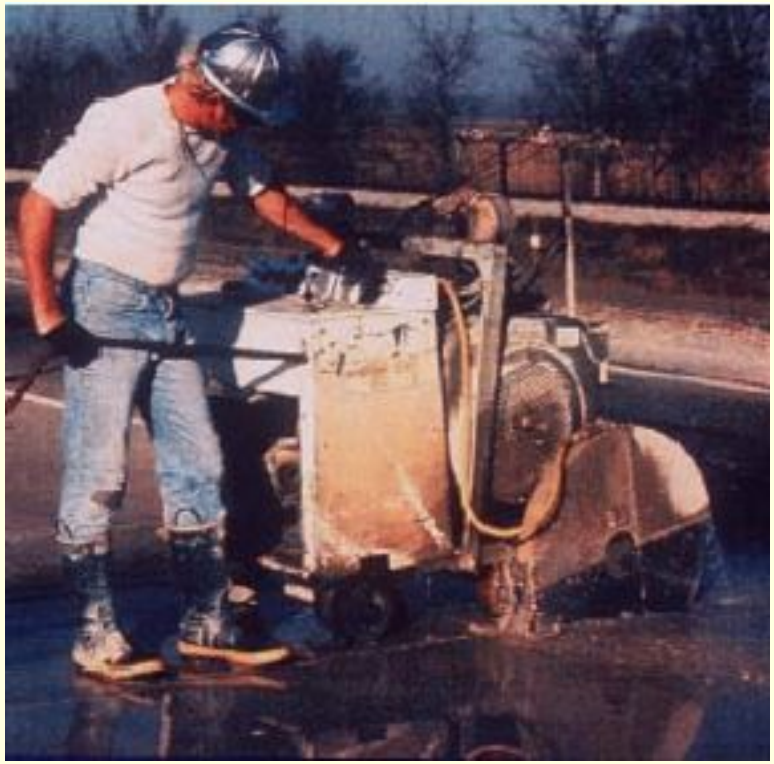
Partial Depth Removal

- Vertical saw cuts, a minimum of 1” to a maximum of 3” in depth.
- Reinforcing steel encountered during removal operation shall be cause for a full depth patch.
- Patches that fall below 3” shall also be cause for a full depth patch.
- All partial depth patches shall be sandblasted and cleaned prior to placing concrete.


2008/06/21

Full Depth Removal

The saw cut shall be full lane width and thickness of the PCCP.



Patches may be broken and dug.


2008/06/21


2008/06/21


2008/06/21

Patches may be sawed and picked.


TEBCO

All subbase material disturbed during the removal operation shall be recompacted


CAT

Patches greater than 18’ long shall have type D-1 contraction joints.

Placing Concrete

- The concrete shall be placed level to the adjacent PCCP and consolidated by internal vibration. The concrete shall be hand finished in accordance with 504.

- Concrete shall be cured in accordance with spec 504.04(a)(Curing Compound). In addition, polyethylene film shall be placed over the patch and covered with a 4” layer of rigid (Styrofoam) or flexible insulation (blankets).

Opening to Traffic

- A patch may be opened to traffic in accordance with the following when calcium chloride is used.

T	H	HT	T	H	HT
40-42°F (4-5°C)	30	26	61-63°F (16-17°C)	14	9
43-45°F (6-7°C)	27	23	64-66°F (18-19°C)	14	9
46-48°F (8-9°C)	24	21	67-69°F (20-21°C)	14	8
49-51°F (10-11°C)	21	19	70-72°F (22°C)	14	7
52-54°F (12°C)	19	16	73-75°F (23-24°C)	14	6
55-57°F (13-14°C)	16	14	Above 75°F(Above 24°C)	14	5
58-60°F (15°C)	16	11			

PCCP patches with calcium chloride may be opened to traffic sooner than permitted by the above table if test beams indicate a modulus of rupture of 300 psi (2100 kPa) or greater

Questions

?

QC/QA PCCP

Tracking Lots & Sublots

Tracking Lots and Sublots

- Guidelines for determining sample locations are described in Standard Specifications, Special Provisions and ITM 802.
- The forms you use may vary from District to District.
- TD-522 QC determines the location of the plastic tests and the cores for each sublot.

TD-522 QC

INDIANA DEPARTMENT OF TRANSPORTATION

Copies To:

DIVISION OF MATERIALS & TESTS

FILE

RANDOM SAMPLING OF QC/QA PCCP

CONTRACT NO. _____ **PAVEMENT DEPTH** _____

ITEM NO. & DESCRIPTION _____

Lot 1

Sublot - Section	Date	CMD No.	Random No. (A)	SYD to be Sampled	CYD Sampled Today	Random Location (Sta., Line, Dir., Lane Width)
1				(A x 2400)		
1-a				(A x 1200)		
1-b				(A x 1200) + 1200		
2				(A x 2400) + 2400		
2-a				(A x 1200) + 2400		
2-b				(A x 1200) + 3600		

Sublot - Section	Date	CMD No.	Random No. (A)	SYD to be Sampled	C Sa T
1				(A x 2400)	
1-a				(A x 1200)	
1-b				(A x 1200) + 1200	
2				(A x 2400) + 2400	
2-a				(A x 1200) + 2400	
2-b				(A x 1200) + 3600	
3				(A x 2400) + 4800	

Random Sampling

- Use random numbers to determine SYD to be sampled.

Sublot - Section	Date	CMD No.	Random No. (A)	SYD to be Sampled	CYD Sampled Today	Random Location (Sta., Line, Dir., Lane Width)
1	9/5/2008	SF004	0.321	770 (A x 2400)		Line J Ct & Rt Ln WB 24' Sta. 731+02
1-a		SF004	0.187	224 (A x 1200)		Line J Ct & Rt Ln WB 24' Sta. 728+97
1-b		SF004	0.169	1403 (A x 1200) + 1200		Line J Ct & Rt Ln WB 24' Sta. 733+39

- For the tests, convert the sample SYD to Lft. to determine the station.
- 770 * 9 / 24’ = 289’
- 728+13 + 289’ = 731+02.

INDIANA DEPARTMENT OF TRANSPORTATION
DIVISION OF MATERIALS & TESTS

DAILY RECORD FOR QC/QA PCCP

CONTRACT NO. _____ **PAVEMENT DEPTH** _____

ITEM NO. & DESCRIPTION **QC/QA PCCP, IN.**

Lot No.	Sublot No.	CMD	Date	W/C Ratio (Y/N)	Location (Sta to Sta, Dir, Lane, Width)	Area SYD	Cum. Lot Qty SYD

Random Sampling

- Track daily production to determine the sublot area for each pour.

Lot No.	Sublot No.	CMD	Date	W/C Ratio (Y/N)	Location (Sta to Sta, Dir, Lane, Width)	Area SYD	Cum. Lot Qty SYD
1	1	SF004	9/5/2008	Y	Line J EB Ct./Rt Lane 24' Sta 728+13-737+13	2400.00	2400.00
1	2	SF004	9/5/2008	Y	Line J EB Ct./Rt Lane 24' Sta. 737+13-744+00	1832.00	4232.00
1	2	SF004	9/9/2008	Y	Line JWN 16' Lane & 8' Shld. Sta. 1745+24-1747+37	568.00	4800.00
1	3	SF004	9/9/2008	Y	Line JWN 16' Lane & 8' Shld. Sta. 1747+38 - 1756+03.31	2310.16	7110.16
1	3	SF004	9/9/2008	Y	Line J EB Lt Turn Ln & Lt Ln 24' Sta. 733+10.58-732+76.89	89.84	7200.00

Entering Test Results

- Suggest you use one report number for each sublot.
- R YY D SUB# 5## L S
- YY = Year
- D = District #
- SUB# = 4 Digit Submitter number
- 5## L S = Sample number where L=Lot, S=Sublot

Tests

- IT-403QE-v1 QC/QA Water Cement Ratio
- IT-404QE-v1 QC/QA PCCP Core Length
- T121QCE-v1 CRA Yield of PC Pavement Concrete
- T152QC-v1 QC/QA Air Content of Concrete
- T97QE-v1 Flexural Strength

INDIANA
Department of Transportation
Test Results

SAMPLE ID:	R083378750011	**CONTRACT ID:**	IR-29410	**SAMPLE DATE:**	09/05/2(
MATERIAL:	501M00010	QC/QA PCCP			
PRODUCER:	CONC1752	Berns Construction Co - Indianapolis, IN			
PRODUCT NAME:					
LOT/SUBLOT:	Lot 1 / Sublot 1				
QUANTITY:	2400	SYS		**SAMPLED FROM:**	Jobsite
STATION:	731+02	**OFFSET:**		**REFERENCE:**	Line J
CONTROL TYPE:		**BEGINNING NUMBER:**		**ENDING**	
JOB MIX FORMULA #:					

STANDARD SAMPLE REMARKS: Sample Information is complete and testing has started.

AUTHORIZED 00/00/0000 **AUTHORIZED BY:**

TEST METHOD: IT403QE-v1 QC/QA Water Cementitious Ratio (ENGLISH)

SAMPLE TEST NUMBER: 50011e

FIELD LABEL	RESULTS	UNITS
Difference	-0.019	

TEST METHOD: IT404QE-v1 QC/QA PCCP Core Length (ENGLISH)

SAMPLE TEST NUMBER: 38479

FIELD LABEL	RESULTS	UNITS
Difference	0.16	IN

TEST METHOD: T121QCE-v1 CRA Yield of PC Pavement Concrete (QC/QA) (ENGLISH)

JOB MIX FORMULA #:

STANDARD SAMPLE REMARKS: Sample Information is complete and testing has started.

AUTHORIZED 00/00/0000 **AUTHORIZED BY:**

TEST METHOD:	IT403QE-v1	QC/QA Water Cementitious Ratio (ENGLISH)		
SAMPLE TEST NUMBER:	50011e			
	FIELD LABEL		**RESULTS**	**UNITS**
Difference			-0.019	

TEST METHOD:	IT404QE-v1	QC/QA PCCP Core Length (ENGLISH)		
SAMPLE TEST NUMBER:	38479			
	FIELD LABEL		**RESULTS**	**UNITS**
Difference			0.16	IN

TEST METHOD:	T121QCE-v1	CRA Yield of PC Pavement Concrete (QC/QA) (ENGLISH)		
SAMPLE TEST NUMBER:	50011b			
	FIELD LABEL		**RESULTS**	**UNITS**
% Difference			-2.6	%
Relative Concrete Yield			1.005	

TEST METHOD:	T152QC-v1	QC/QA Air Content of Concrete		
SAMPLE TEST NUMBER:	50011a			
	FIELD LABEL		**RESULTS**	**UNITS**
Difference			-0.5	%

TEST METHOD:	T97QE-v1	QC/QA Flexural Strength (ENGLISH)		
SAMPLE TEST NUMBER:	50011c			
	FIELD LABEL		**RESULTS**	**UNITS**
Difference			95	