SEATTLEU

DESIMONE

A Data Curation System and Predictive Model for Unconfined Concrete Strength

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Agenda

01 Sponsor

02 Challenges

03 Solution

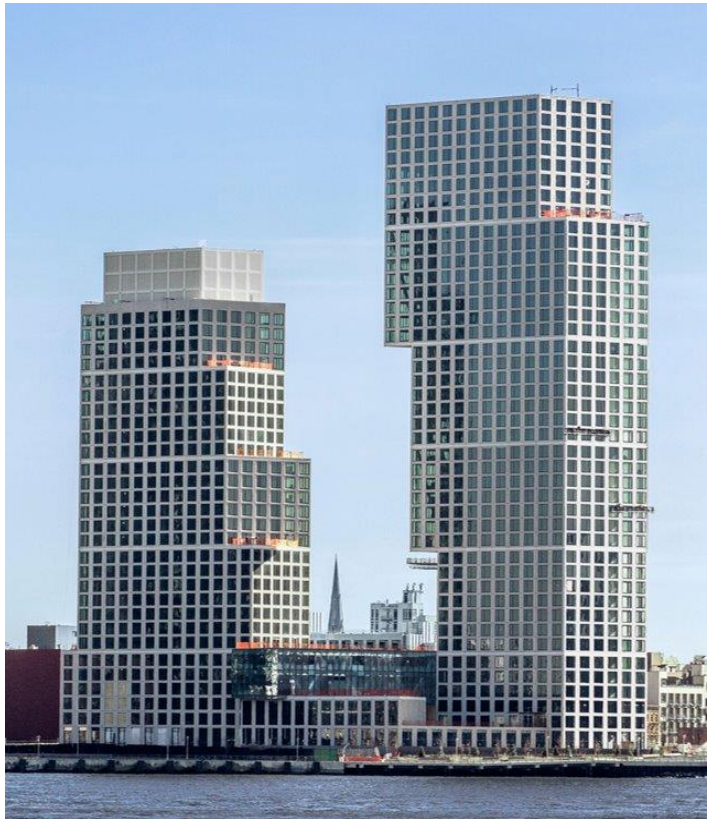
04 Benefits

Our Sponsor

DESIMONE

Wasl Tower, Dubai, United Arab Emirates

Seminole Hard Rock Hollywood Hotel &
Casino Expansion, Hollywood, Florida



Greenpoint Landing – Block D, Brooklyn, New York

Determining the Unconfined Concrete Strength of the material:

Video source: https://www.youtube.com/watch?v=AR_fjmV2Mpk

Challenges

Test results in **PDF** format.

Files stored in a **Nested Shared Drive**

Inefficient system for analyzing and visualizing the data.

Need to **predict** the **unconfined concrete strength** and identify the key factors affecting it.

Sample PDF Report

ASSOCIATES CONCRETE COMPRESSION TEST REPORT

(Accordance with ASTM C-39, ASTM C-617 or C-1231)

CLIENT: LLC

PROJECT: Nashville, TN

Nashville TN 37219

PROJECT MGR:

DATE MOLDED: 02-Mar-22 **DATE ISSUED:** 27-Apr-22 **LAB NUMBER:** 11705 **PROJECT NO.** 21004

LOCATION OF PLACEMENT: Level 16 - 17; SW - Core & Columns A.2-1, B-1, C-1, D-1

Sampling - Concrete ASTM C-172,
Mortar C-109

CONTRACTOR:			**QUANTITY: (Cu. Yds.):**	9 (9 of 72)	
CONCRETE SUPPLIER:			**WATER ADDED(GALS):**	0	
MIX ID NO:	7827CM		**UNIT WEIGHT(PCF):**	148.7	*ASTM C-138*
TRUCK NO:	2712		**AIR CONTENT(%):**	2.4	*ASTM C-231*
TICKET NO:	88047639		**SLUMP(IN):**	19 (SPREAD)	*ASTM C-143*
WEATHER:	Clear		**SLUMP W/HRWR(IN):**	N/A	
AMBIENT TEMP(F):	77		**SET NO:**	1 of 1	
CONCRETE TEMP(F):	73	*ASTM C-1064*	**TECHNICIAN:**		
TIME BATCHED:	03:37 PM		**INFO/MOLDED BY:**	GTA	
TIME MOLDED:	04:18 PM	*ASTM C-31*	**DELIVERED BY:**	GTA	

COMPRESSION TEST RESULTS

LAB NO.	SET NO.	DATE RECEIVED	AGE-DAYS	DATE TESTED	TOTAL LOAD(LBS)	UNIT LOAD(PSI)	REMARKS
11705	1 of 1	08-Mar-22					
			7	09-Mar-22	118780	**9460**	
			28	30-Mar-22	154060	**12250**	
			28	30-Mar-22			
			56	27-Apr-22	161650	**12860**	
			56	27-Apr-22	160620	**12770**	
			56	27-Apr-22	159570	**12700**	
			56	27-Apr-22			

Remarks Note: P=Pad Caps (ASTM C1231) S=Sulphur Caps (ASTM C617) Numbers 1-5= Fracture Type

Fracture Type: 1 (Cone) 2 (Cone and Split) 3 (Columnar) 4 (Shear) 5 (Side Fracture)

NO. SUBMITTED: 6 **SIZE:** 4 X 8 **DIAMETER:** **AREA** 12.57 **REQUIRED PSI :** **12000**

Solution

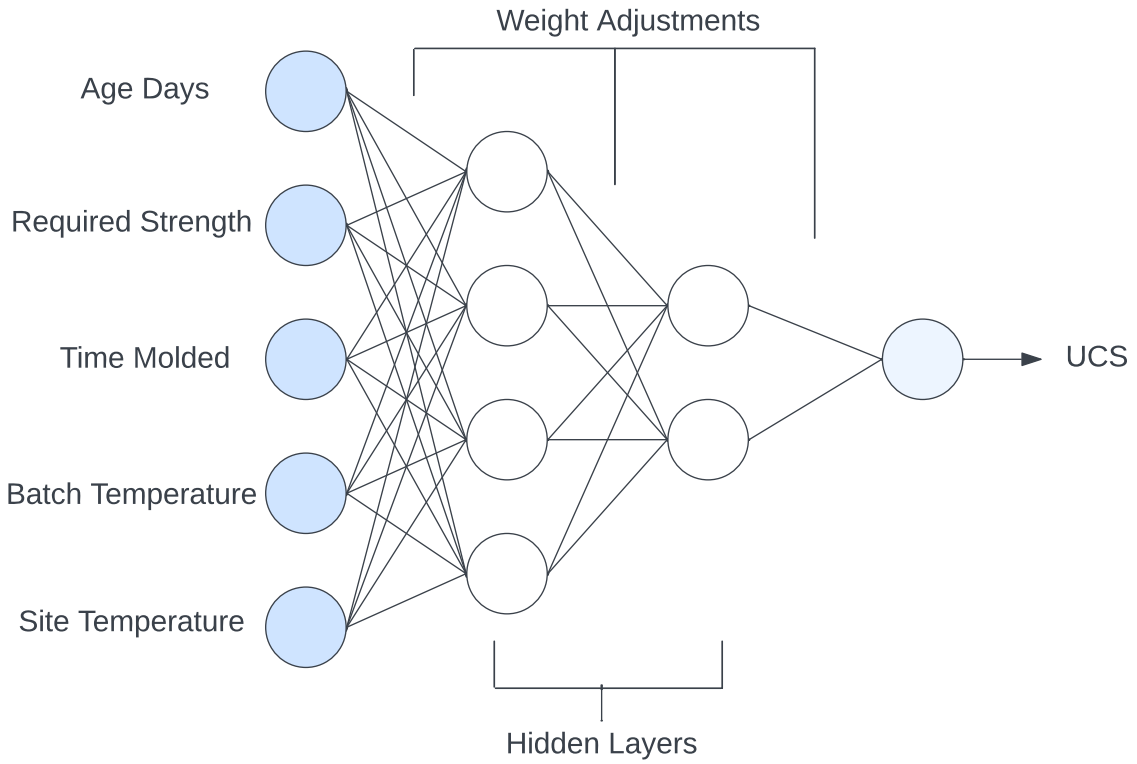
Data Extraction using Scraper

Export Clean Structured Data

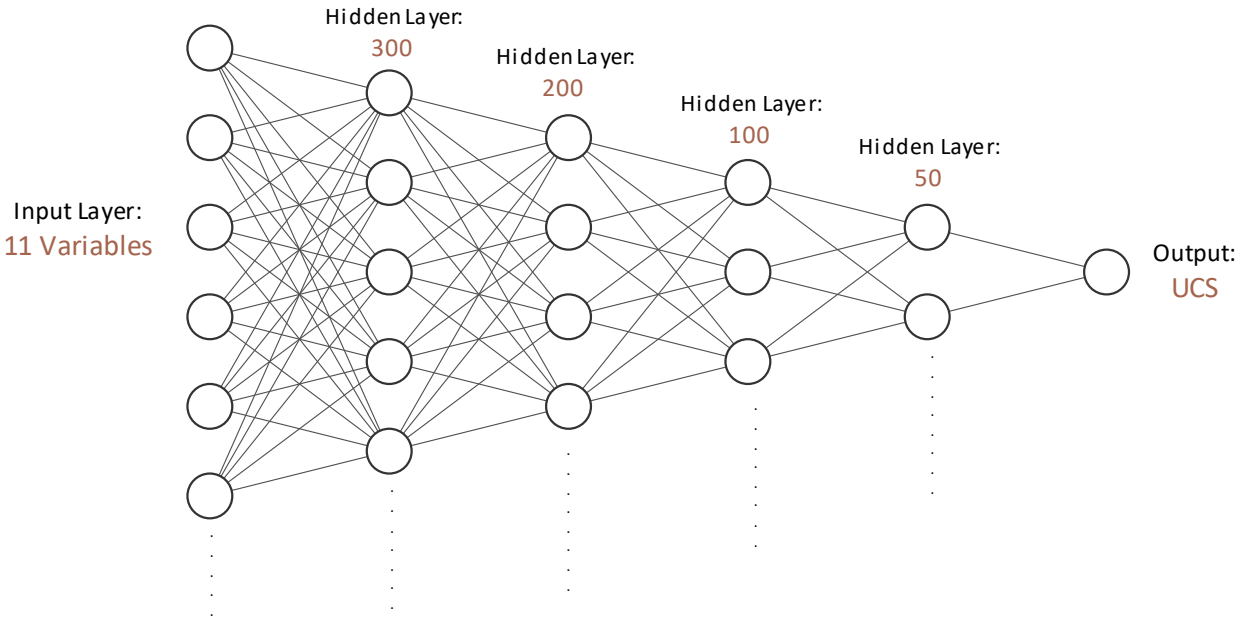
Predictive Model for Compressive Strength

Presentation Platform

Artificial Neural Network

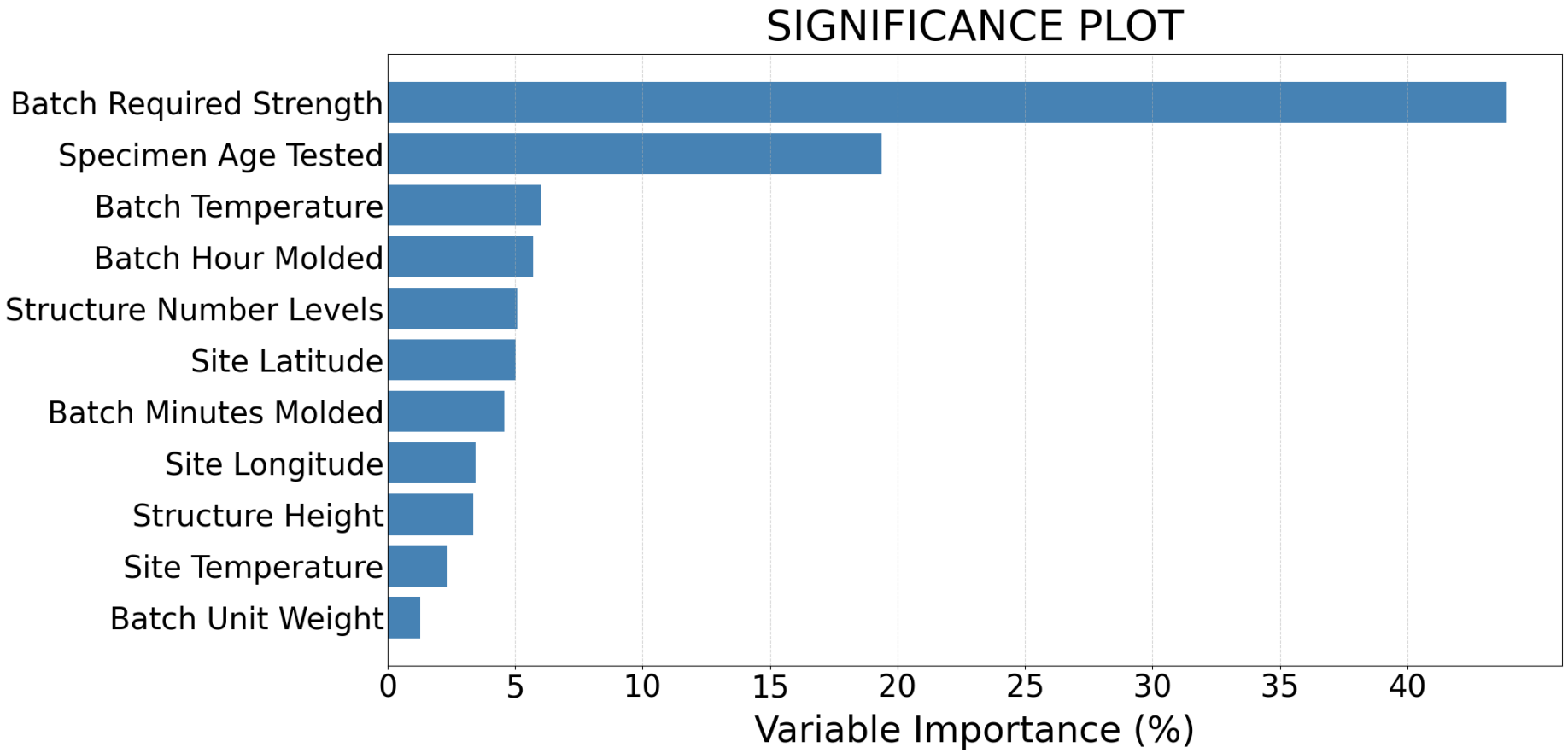


Model Performance

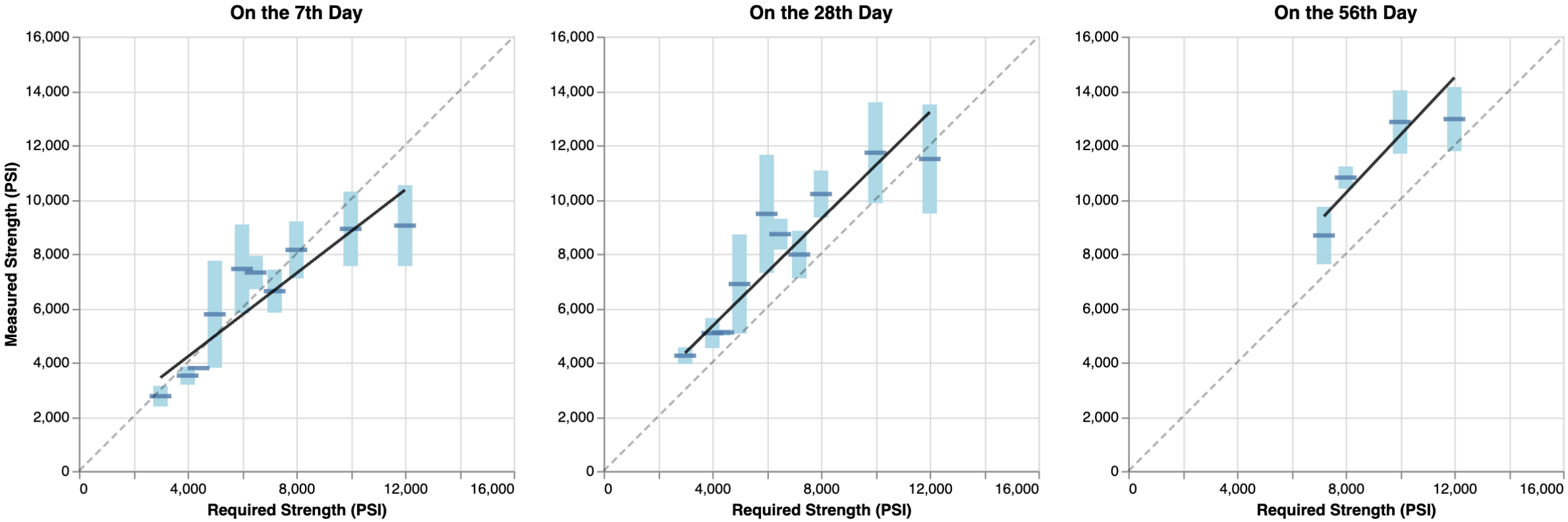


Test RMSE : 991

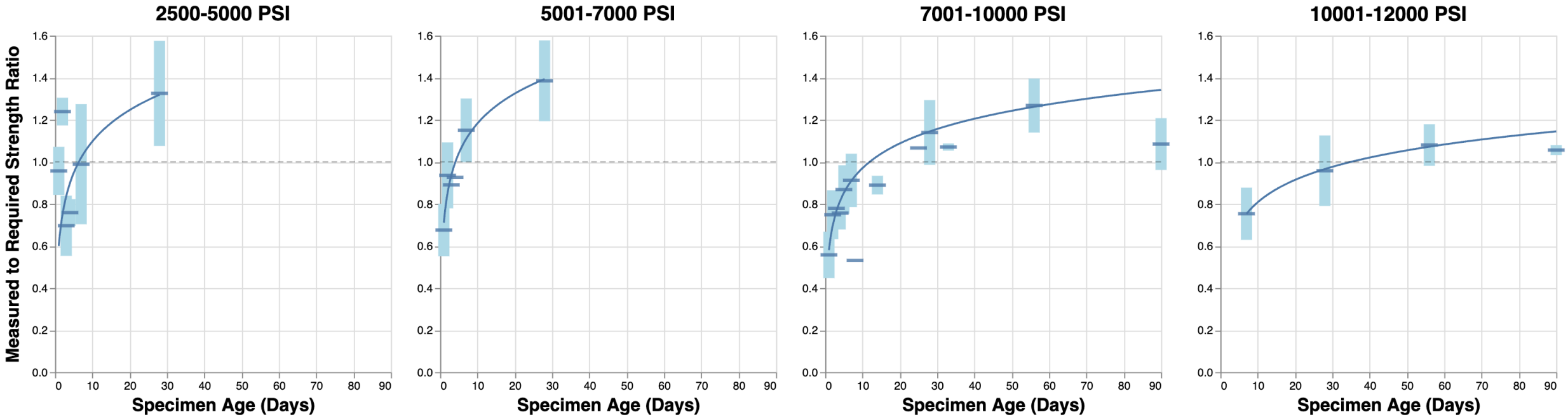
Results


SIGNIFICANCE PLOT
Batch Required Strength
Specimen Age Tested
Batch Temperature
Batch Hour Molded
Structure Number Levels
Site Latitude
Batch Minutes Molded
Site Longitude
Structure Height
Site Temperature
Batch Unit Weight
0
5
10
15
20
25
30
35
40
Variable Importance (%)

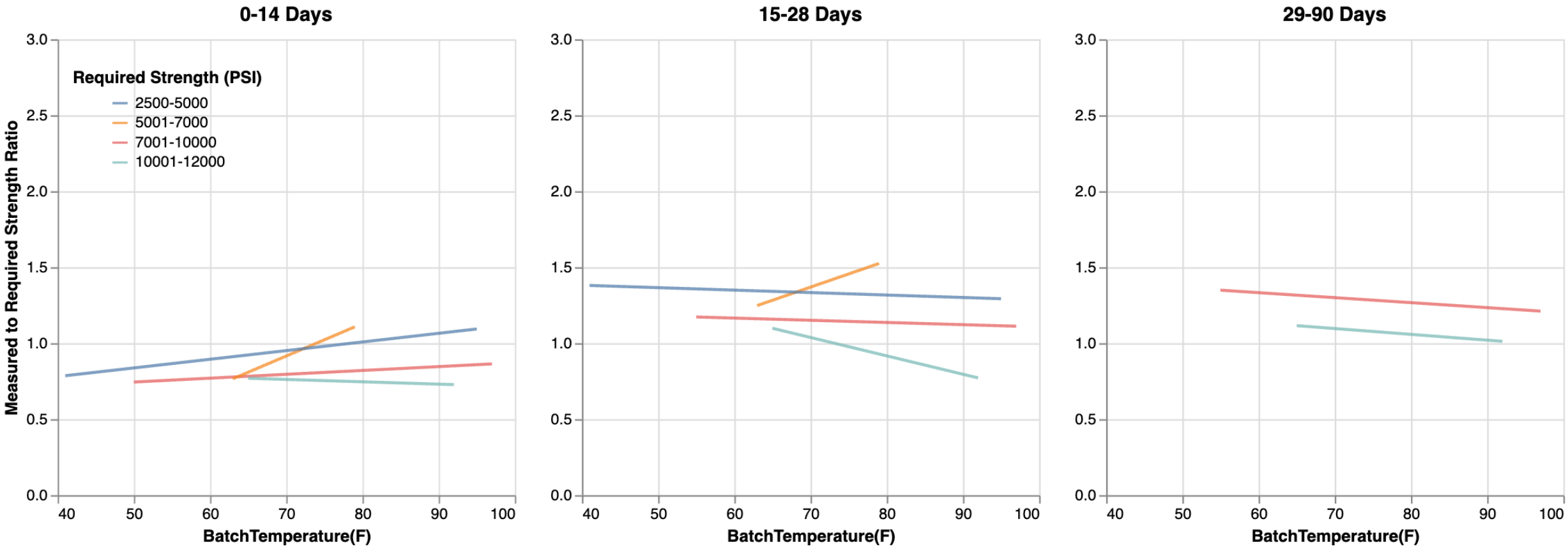
Measured Strength vs Required Strength on 7th, 28th, and 56th Day



Measured to Required Strength Ratio vs Specimen Age (Grouped by Required Strength)



Batch Temperature vs Measured to Required Strength (Grouped by Specimen Age, Colored by Required Strength)



Conclusion

Addressed Data Management challenges

Predicted Unconfined Concrete Strength

Visualized the data to gain valuable insights

Save stakeholder's budget, time, and labor

Acknowledgement

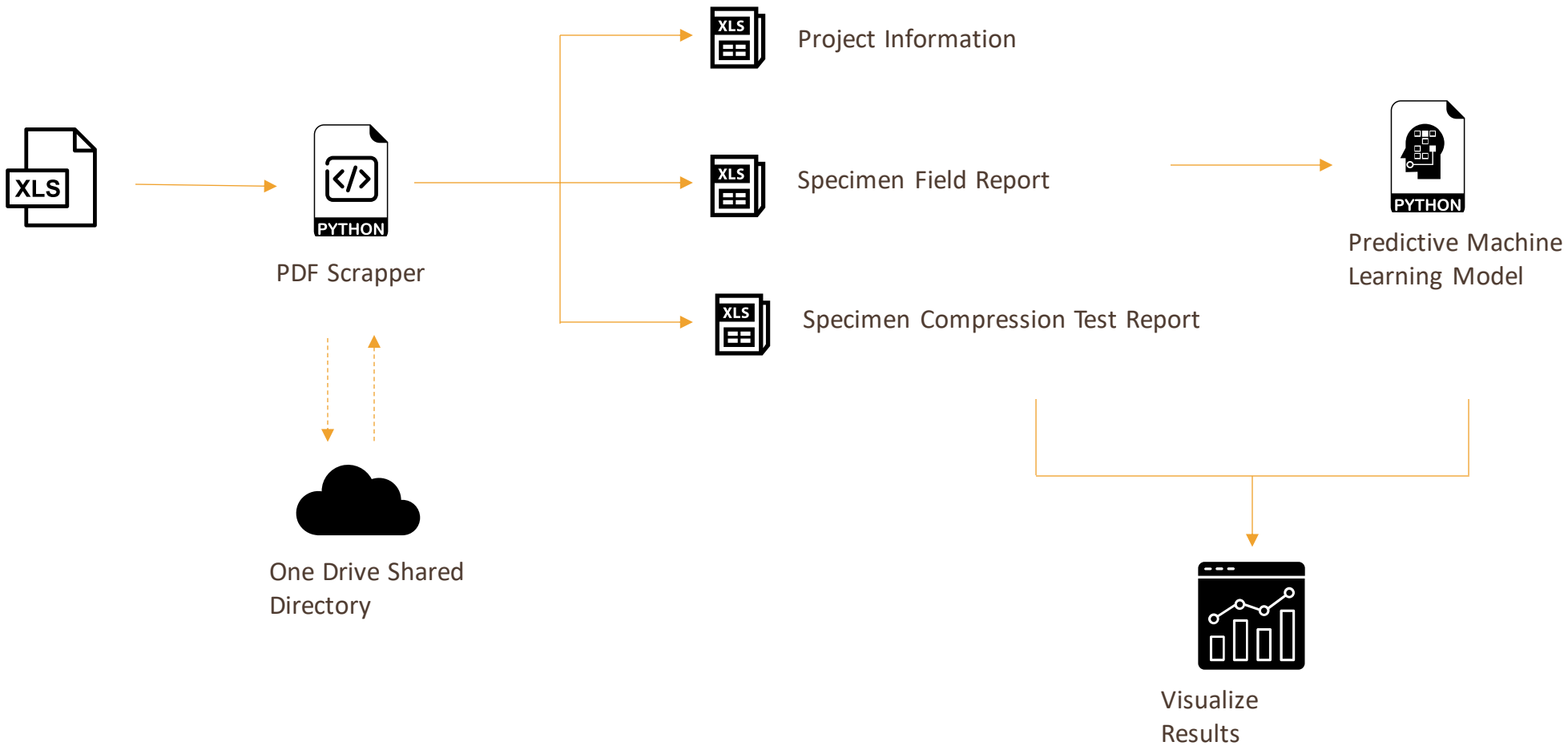
DESIMONE

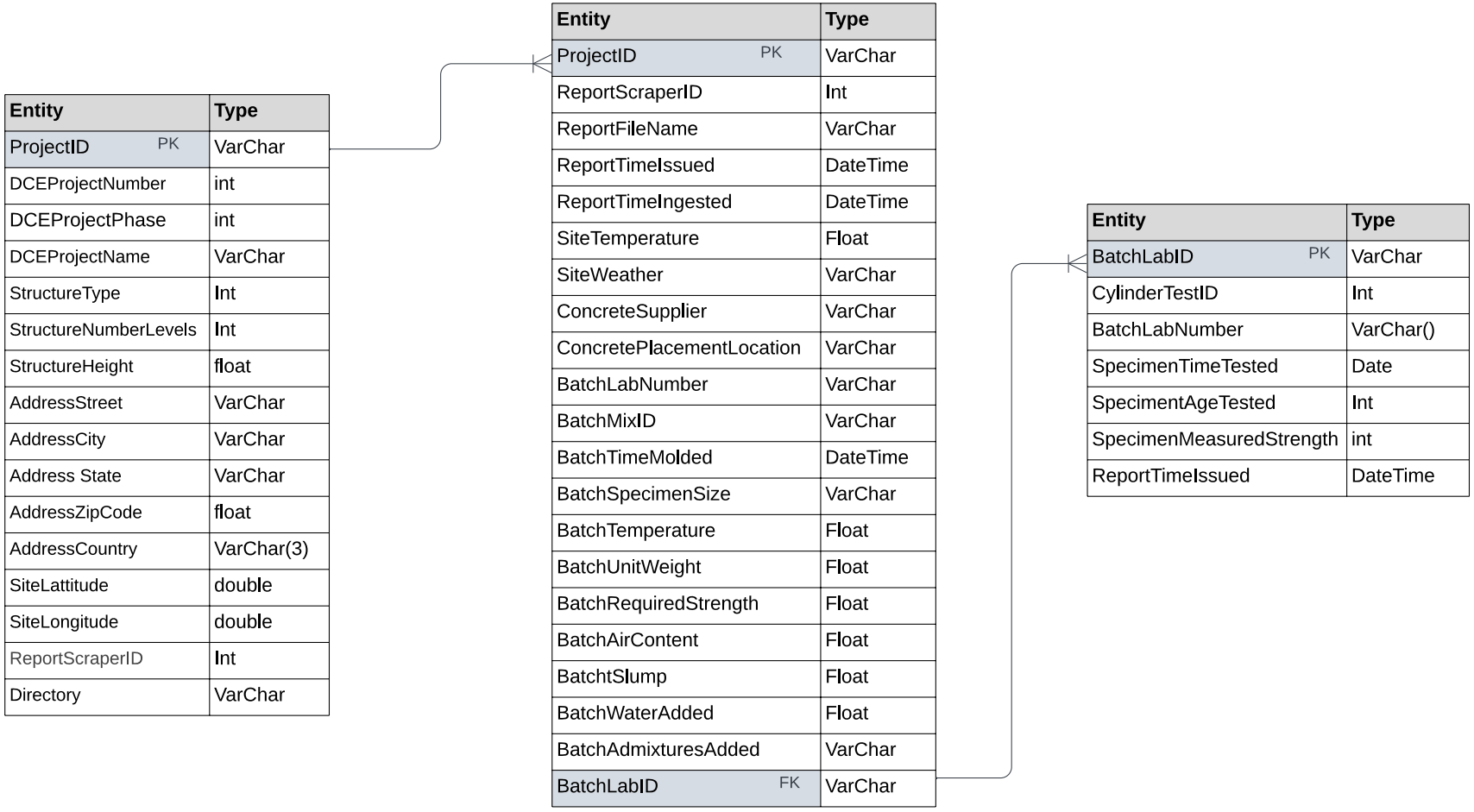
- Jeff Dragovich, Ph.D, PE, SE, F.ACI
- Matthew Cummins, P.E., S.E.

SEATTLEU

- Ariana Mendible, Ph.D
- Project Center, College Of Science And Engineering

Thank You!


XLS
PYTHON
PDF Scrapper
XLS
Project Information
XLS
Specimen Field Report
XLS
Specimen Compression Test Report
PYTHON
Predictive Machine Learning Model
One Drive Shared Directory
Visualize Results


Entity
Type
ProjectID
PK
VarChar
DCEProjectNumber
int
DCEProjectPhase
int
DCEProjectName
VarChar
StructureType
Int
StructureNumberLevels
Int
StructureHeight
float
AddressStreet
VarChar
AddressCity
VarChar
Address State
VarChar
AddressZipCode
float
AddressCountry
VarChar(3)
SiteLattitude
double
SiteLongitude
double
ReportScraperID
Int
Directory
VarChar
Entity
Type
ProjectID
PK
VarChar
ReportScraperID
Int
ReportFileName
VarChar
ReportTimeIssued
DateTime
ReportTimeIngested
DateTime
SiteTemperature
Float
SiteWeather
VarChar
ConcreteSupplier
VarChar
ConcretePlacementLocation
VarChar
BatchLabNumber
VarChar
BatchMixID
VarChar
BatchTimeMolded
DateTime
BatchSpecimenSize
VarChar
BatchTemperature
Float
BatchUnitWeight
Float
BatchRequiredStrength
Float
BatchAirContent
Float
BatchtSlump
Float
BatchWaterAdded
Float
BatchAdmixturesAdded
VarChar
BatchLabID
FK
VarChar
Entity
Type
BatchLabID
PK
VarChar
CylinderTestID
Int
BatchLabNumber
VarChar()
SpecimenTimeTested
Date
SpecimentAgeTested
Int
SpecimenMeasuredStrength
int
ReportTimeIssued
DateTime