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PLANS OF PROPOSED IMPROVEMENT ON THE

PRIMARY ROAD SYSTEM

Story COUNTY

RCB Culvert New - Triple Box

US 30 over S. Skunk River
W of the South Skunk River (WB)

Refer to the Plan Sheets for list of applicable specifications.

Value Engineering Saves. Refer to Article 1105.13 of the Specifications.



Iowa DOT Bridges and Structures
Consultant Coordinator Contact:
Lili Yang

Design Data Urban				
WB US 30				
2024	AADT	16,400	V.P.D.	
Truck	DHV	8	%	
WB Lane Only				

Index Of Seals		
Sheet No.	Name	Type
A.1	Jacob J. Shaw	Structural Design
SPS.1	* Adam Tyler	Geotechnical Design
Culvert Standards	James S. Nelson	Structural Design

* Braun Intertec

Revisions

TOTAL
8
PROJECT IDENTIFICATION NUMBER
19-85-030-020
PROJECT NUMBER
NHSX-030-5(312)--3H-85
R.O.W. PROJECT NUMBER
PROJECT DIRECTORY NUMBER
8503002019

English Culvert Standards - Cast-In-Place

Standard	Issued	Revised
TRRCB G3-20	07-20	-
TRRCB 12-9-20	07-20	-
TRPWH 0-1-20	07-20	-
TRPWH 0-2-20	07-20	08-22
TRPWH 0-3-20	07-20	-
TRPWH 0-4-20	07-20	-
TRPWH 0-5-20	07-20	-
TRPWH 0-6-20	07-20	-

Structural Design



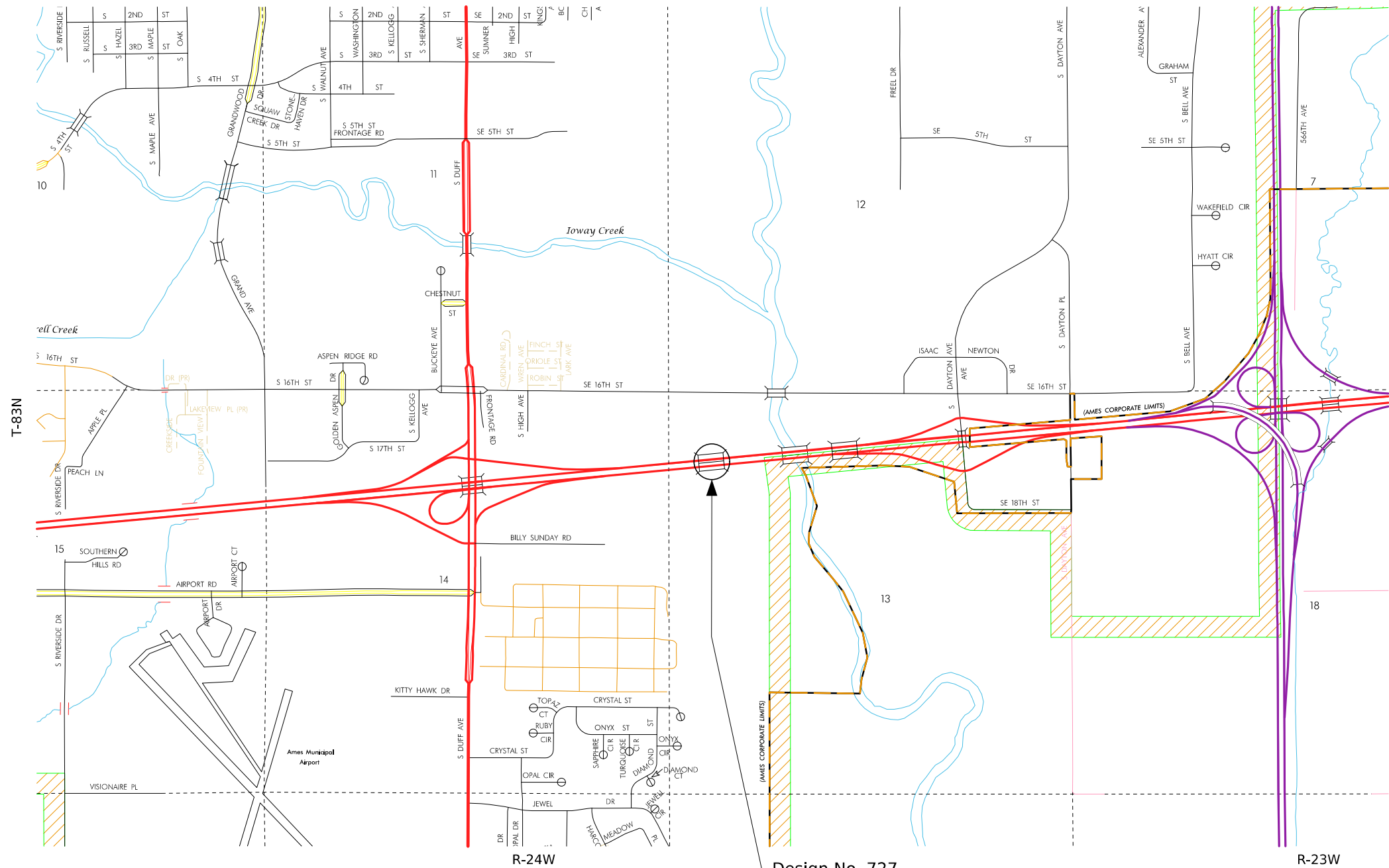
I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

Signature: *Jacob J. Shaw* Date: 6/15/2026

Printed or Typed Name: Jacob J. Shaw

My license renewal date is December 31, 2026

Pages or sheets covered by this seal: Sheets A.1 - A.2, V.1 - V.4



LEGEND

INTERSTATE ROUTE

FREEWAY OR EXPRESSWAY ROUTE

U.S. NUMBERED ROUTE

BUSINESS ROUTE

STATE NUMBERED ROUTE

UNSIGNED ROUTE

COUNTY NUMBERED ROUTE

SECONDARY ROAD OR ADJOINING CITY STREET

CITY STREET

PARK, INSTITUTION, OR FEDERAL ROAD

RAILROAD

CORPORATION LINE

SECTION LINE

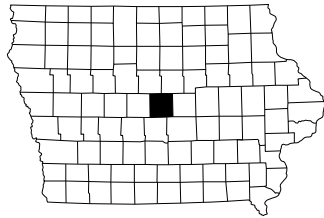
CUL-DE-SAC

SECTION, TOWNSHIP & RANGE NUMBERS

9, T-81N, R-30W

Part of City of Ames

Not To Scale



ESTIMATED CAST-IN-PLACE CULVERT QUANTITIES					
ITEM NO.	ITEM CODE	ITEM	UNIT	DESIGN NO. 727	AS-BUILT QTY.
1	2104-2710020	Excavation, Class 10, Channel	CY	247.1	
2	2402-2720000	Excavation, Class 20	CY	3,077	
3	2402-3825025	Granular Material for Blanket	CY	206	
4	2403-0100020	Structural Concrete (RCB Culvert)	CY	452.2	
5	2404-7775000	Reinforcing Steel	LB	77487	
6	2501-8400172	Temporary Shoring	LS	1	
7	2507-3250005	Engineering Fabric	SY	542.0	
8	2507-6800061	Revetment, Class E	TON	370.6	
9	2526-8285040	Construction Survey, Location Survey	LS	1	
10	2533-4980005	Mobilization	LS	1	

CAST-IN-PLACE CULVERT ESTIMATE REFERENCE INFORMATION		
ITEM NO.	ITEM CODE	DESCRIPTION
1	2104-2710020	Excavation, Class 10, Channel Dispose of excess material according to Article 1106.07 of the current specifications.
2	2402-2720000	Excavation, Class 20 Includes filling and compacting low areas around proposed culvert. Quantity should be reduced by 307 CY in the event that the working blanket is deleted. Includes excavation necessary for "Granular Material for Blanket".
3	2402-3825025	Granular Material for Blanket Granular material shall be in accordance with Section 4118 of the Standard Specifications. Includes 206 CY for a working blanket. The working blanket may be deleted if determined to be unnecessary at the time of construction.
4	2403-0100020	Structural Concrete (RCB Culvert) ---
5	2404-7775000	Reinforcing Steel ---
6	2501-8400172	Temporary Shoring This item will be deleted if the existing shoring from Stage 1 is adequate for Stage 2.
7	2507-3250005	Engineering Fabric Engineering fabric shall be material as specified for embankment erosion control in accordance with Article 4196.01,B,3, of the Standard Specifications. Material shall be measured in sq. yard of actual area covered.
8	2507-6800061	Revetment, Class E Estimated at 1.5 ton/cu yd. Class E revetment shall meet requirements of Article 4130. Broken concrete and granite is not allowed.
9	2526-8285040	Construction Survey, Location Survey ---
10	2533-4980005	Mobilization ---



Note:
Roadway quantities are included in the tied road plans, Project No. NHSX-030-5(310)--3H-85.

Design For 0° Skew

Triple 12' x 9' x 191'-0" (105'-0" Stage 2)
Cast-In-Place RCB Culvert

Estimated Quantities

STA. 1293+50.00 (US 30) Turn-In Date: August 2026

Story County

IOWA DEPARTMENT OF TRANSPORTATION

Design No. 727 Design Sheet No. 1 of 4 FHWA No. 701205

Summary of Concrete Quantities				
Location	Footing	Walls	Slab	Total
38'-0" Barrel Section (1 Required)	1 @ 49.4	1 @ 36.2	1 @ 48.8	134.4
35'-0" Barrel Section (1 Required)	1 @ 45.5	1 @ 33.3	1 @ 45.0	123.8
20'-0" Barrel Section (1 Required)	1 @ 26.0	1 @ 19.0	1 @ 25.7	70.7
12'-0" Barrel Section (1 Required)	1 @ 15.6	1 @ 11.4	1 @ 15.4	42.4
*Headwall 0° Skew (1 Required)	1 @ 58.4	1 @ 18.9	1 @ 3.6	80.9
Total (CY)	194.9	118.8	138.5	452.2

*Includes parapet and top of wingwall.

Summary of Reinforcing Steel		
Location	Quantity	Total
38'-0" Barrel Section (1 Required)	1 @ 24,157	24,157
35'-0" Barrel Section (1 Required)	1 @ 22,250	22,250
20'-0" Barrel Section (1 Required)	1 @ 12,714	12,714
12'-0" Barrel Section (1 Required)	1 @ 7,629	7,629
Headwall 0° Skew (1 Required)	1 @ 10,197	10,197
*5r1 x 3'-6" Dowel Bars (3 Required)	3 @ 146	438
**5z1 x 2'-6" Dowel Bars (1 Required)	1 @ 102	102
Total (LB)		77,487

*One Set Includes 40 - 5r1 Bars = 146 LBS.

**One Set Includes 39 - 5z1 Bars = 102 LBS.

404 Permit information and the pollution prevention plan are included in the tied road plans, Project No. NHSX-030-5(310)--3H-85.



English Culvert Standards - Cast-In-Place		
Standard	Issued	Revised
TRRCB G3-20	07-20	--
TRRCB 12-9-20	07-20	--
TRPWH 0-1-20	07-20	--
TRPWH 0-2-20	07-20	08-22
TRPWH 0-3-20	07-20	--
TRPWH 0-4-20	07-20	--
TRPWH 0-5-20	07-20	--
TRPWH 0-6-20	07-20	--

Design For 0° Skew

Triple 12' x 9' x 191'-0" (105'-0" Stage 2)
Cast-In-Place RCB Culvert

Culvert Quantities

STA. 1293+50.00 (US 30) Turn-In Date: August 2026

Story County

IOWA DEPARTMENT OF TRANSPORTATION

Design No. 727 Design Sheet No. 2 of 4 FHWA No. 701205

General Notes:

It is the intent of this design to construct a triple 12' x 9' x 191' (105' Stage 2) cast-in-place reinforced concrete box culvert skewed 0° at station 1293+50. Faint lines on plans indicate existing structure.

The City and utility companies whose facilities are shown on the plans or known to be within the construction limits shall be notified by the Bridge Contractor of the construction starting date.

The roadway will be open to traffic during construction. See Traffic Control Note.

The R.C.B. Culvert sections are designed for HL-93 live load and earth fills of 2 feet.

Vertical earth pressure, EV=0.120 kcf.

Horizontal earth pressure, EHmax = 0.060 kcf max, EHmin = 0.030 kcf.

The R.C.B. culvert sections are designed for Class 1 exposure conditions.

All slab and floor reinforcing steel is to be supported at intervals of not more than 3'-0" in either direction as outlined in the Standard Specifications.

The clear distance from face of concrete to near edge or end of reinforcing bar to be 2" unless otherwise noted.

Except for dowel bars 5r1 & 5z1 in slab, longitudinal reinforcing is not to extend thru the construction joints.

Floor of barrel is to be finished smooth. Sides of footing are to be formed to ensure correct line and grade.

The permissible construction joint at the top of the walls may be lowered at the Contractor's option with Engineer's approval.

The reinforcement supplied for this structure shall be Grade 60 reinforcement in accordance with the Standard Specifications. The design stresses are based on ASTM A706 Grade 60 reinforcement.

The vertical bars in the walls may be spliced above the footing at the Contractor's option as follows:

Bar Size Number	4	5	6	7	8	9
Minimum Splice Length	20"	24"	29"	34"	38"	47"

This splice, if used, will be at the Contractor's expense.

Reinforcing bar clearances will be as follows:

Edge clearances:	2" except
Top of floor	2¼" to near transverse reinforcing bar
Bottom of floor	3½" to near transverse reinforcing bar
End clearances:	
Vertical top	2"
Vertical bottom	3" or 3½" if overall height of the culvert is not to a full inch
Transverse	2"

All construction joints shall be formed with a beveled keyway.

All beveled keyways shall be centered.

Keyway size shall be 2"x4".

Keyway dimensions shown on the plans are based on nominal dimensions unless stated otherwise. In addition, the bevel used on the keyway shall be limited to a maximum of 10 degrees from vertical.

All dimensions are in feet and inches unless otherwise noted or shown.

See current Standard Specifications regarding concrete form removal.

These culvert standards label all reinforcing steel with English notation (5a1 is 5⁄8 inch diameter bar). English reinforcing steel received in the field may display the following "bar designation". The "bar designation" is the stamped impression on the reinforcing bars, and is equivalent to the bar diameter in millimeters.

English Size	3	4	5	6	7	8	9	10	11
Bar Designation	10	13	16	19	22	25	29	32	36

When de-watering presents a problem for placing the curtain walls as detailed, alternate methods such as steel sheet pile and precast concrete walls may be approved but at no additional cost. The Culvert Contractor is to submit to the Engineer for approval complete drawings of the proposed curtain wall alternate before beginning construction.

All reinforcing bars and bars noted as dowels supplied for this structure shall be deformed reinforcement unless otherwise noted or shown.

All exposed corners 90 degrees or sharper to be filleted with a 3/4" dressed and beveled strip.

The Class 20 Excavation quantity is based on the assumption that at the start of culvert construction, the existing groundline shown on the "Situation Plan" for this design.

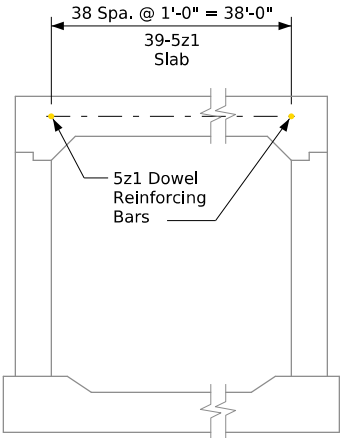
Class 20 Excavation unsuitable for backfilling shall be disposed of in a manner that will leave the site in a neat condition.

It shall be the Culvert Contractor's responsibility to provide sites for excess excavated material. No payment for overhaul will be allowed for material hauled to these sites.



Excess Class 20 Excavation material suitable for backfilling shall be stockpiled at the construction site, as directed by the Engineer.

5z1 x 2'-6" dowel reinforcing bars with a 10 inches minimum embedment into existing concrete shall be set in the slab of the existing culvert. The 5z1 x 2'-6" dowel reinforcing bars shall be centered in the existing slab. All dowels shall be at 1'-0" maximum spacing $\text{C-}\text{C}$ of dowels. Dowels shall be set with polymer grout in accordance with Article 2301.03, E, of the Standard Specifications, and current Supplemental Specifications of the Iowa D.O.T. Highway Division.



Section Near Stage Construction Joint
(Showing spacing of 5z1 dowel bars)

Specifications:

Design:
AASHTO LRFD Bridge Design Specifications, 8th Ed., Series of 2017.

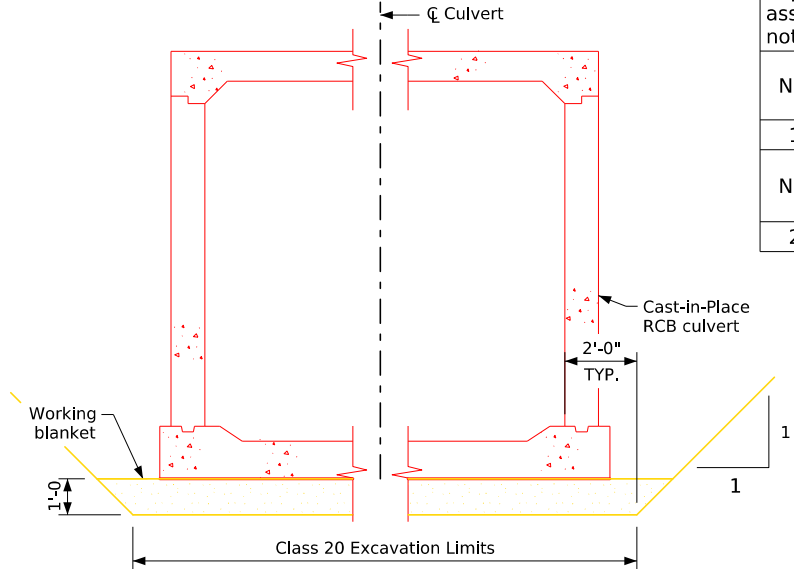
Construction:
Iowa Department of Transportation Standard Specifications for Highway and Bridge Construction, Series 2023, plus applicable General Supplemental Specifications, Developmental Specifications, Supplemental Specifications and Special Provisions.

Design Stresses:

Design stresses for the following materials are in accordance with the AASHTO LRFD Bridge Design Specifications, 8th Ed., Series of 2017:

Reinforcing steel in accordance with AASHTO LRFD Section 5, Grade 60.

Concrete in accordance with AASHTO LRFD Section 5, f'c = 4.0 ksi.



Working Blanket Detail
(Cast-in-Place RCB Culvert)

Working blanket shall terminate 3'-0 short of curtain wall. See Standard Road Plan DR-111 for backfilling requirements.

Temporary Shoring Notes:

Temporary shoring (sheet pile or other) shall be required as necessary to prevent the earth under the traffic lane from sloughing in during construction.

The Contractor shall submit a Temporary Shoring Plan for review. The Temporary Shoring Plan shall be designed and certified by a Professional Engineer licensed in the State of Iowa. When determining slope stability to support structures such as bridges, culverts and retaining walls, a global stability analysis shall be included in the design of the temporary shoring in accordance with Chapter 200F-1 in the Design Manual of the Iowa DOT, Design Bureau. The Contractor shall not proceed with installation of the temporary shoring without notice to proceed from the Engineer.

- The temporary shoring submittal shall include:
- Design calculations (including a global stability analysis)
 - Soil properties
 - Shoring material properties
 - Shoring plan layout (showing location of traffic)
 - Shoring details

Temporary shoring shall be paid for as a lump sum including all cost for designing, furnishing, and installing. Temporary shoring shall be abandoned in place. In addition to the requirements noted above, Article 1107.07 of the Standard Specifications still applies.

During construction of this project the Culvert Contractor will be required to coordinate operations with those of other Contractors working within the same area. Other work in progress during the same period of time will include, but is not limited to, construction of the following projects:

PCC Pavement - Grade & New	NHSX-030-5(310)--3H-85
Bridge Replacement - PPCB	BRF-030-5(311)--38-85
RCB Culvert New - Triple Box	NHSX-030-5(313)--3H-85
Traffic Signs	NHSX-030-5(314)--3H-85
Lighting	NHSX-030-5(315)--3H-85
Erosion Control	NHSN-030-5(316)--2R-85

Working Drawing and Calculation Submittals			
Working drawings and calculations shall be submitted for the following items shown in the table below. (Note additional working drawings and calculations may be required in accordance with Article 1105.03 of the Standard Specifications.)			
Submittal requirements for working drawings and calculations shall be in accordance with 1105.03 of the Standard Specifications for Highway and Bridge Construction of the Iowa Department of Transportation. The absence of a certification requirement for a submittal does not relieve the Contractor of the responsibility to attain certification.			
Calculation submittals in this table which are associated with working drawing submittals shall be submitted on the same day. Review time for calculation submittals shall be of the same duration as and run concurrently with review time for associated working drawings. The calculation submittals listed in the table are not meant to be an exhaustive list and do not relieve the Contractor from providing additional calculation submittals if requested by the Engineer.			
No.	Working Drawing Description	Working Drawing File Name Convention For Submittal	Certified by Iowa P.E. (Yes/No)
1	Temporary Shoring	(312)_Story_Design727_TemporaryShoring.pdf	Yes
No.	Calculation Description	Calculation File Name Convention For Submittal	Certified by Iowa P.E. (Yes/No)
2	Temporary Shoring	(312)_Story_Design727_TemporaryShoringCalcs.pdf	Yes

Traffic Control Plan

The Westbound roadway will be open to thru traffic. Refer to the Traffic Control Plan included in the tied Road Plans, Project No. NHSX-030-5(310)--3H-85.

Design For 0° Skew

Triple 12' x 9' x 191'-0" (105'-0" Stage 2)
Cast-In-Place RCB Culvert

General Notes

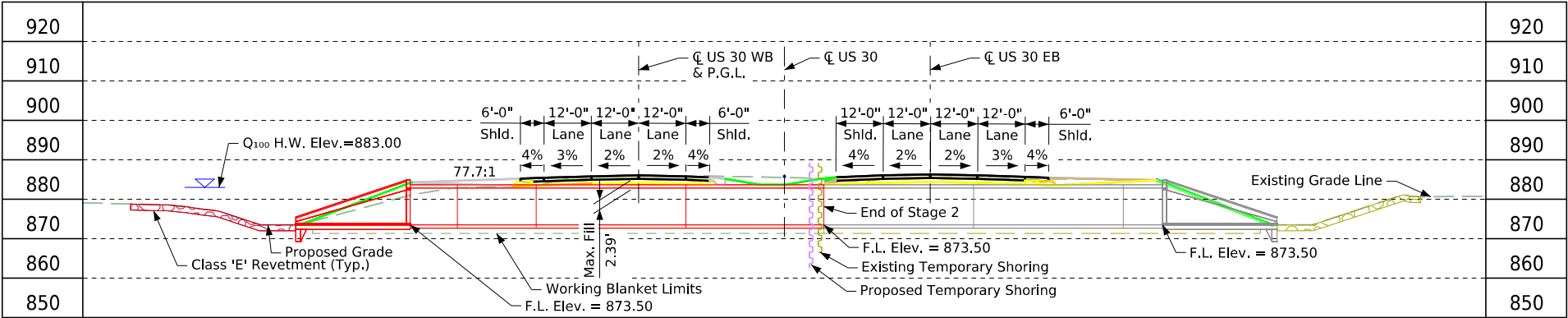
STA. 1293+50.00 (US 30) Turn-in Date: August 2026

Story County

IOWA DEPARTMENT OF TRANSPORTATION

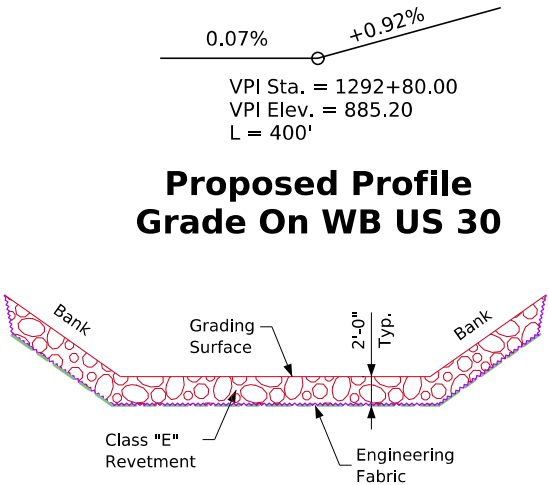
Design No. 727 Design Sheet No. 3 of 4 FHWA No. 701205

Control Point: N. 7639937.050, E. 18534748.551, Elev. 878.893 CP FD NGS MON 48' South of US 30 EB ☐, 670' West of Dayton Ave. ☐



Longitudinal Section Along ☐ Culvert

Design Fill = 2'-0"
Anticipated Settlement <= 1 inch



Proposed Profile
Grade On WB US 30

Inlet Revetment Detail

Utilities Note

Utilities shown on this sheet are for information only. See tied road plans, Project No. NHSX-030-5(310)--3H-85 for utility information.

General Utility Symbols

FO - Fiber Optic Line (Iowa Communications Network)

Traffic Estimate

2024 AADT 16,400 V.P.D.
Trucks 8 %

Note:
Includes W.B. Lane Only

Hydraulic Data

Drainage Area = 556 Sq. Mi. (Overflow)
Q₅₀ = 1,090 CFS (19,900 CFS) *
HW Elev. = 882.3
Exit Velocity = 3.6 FPS

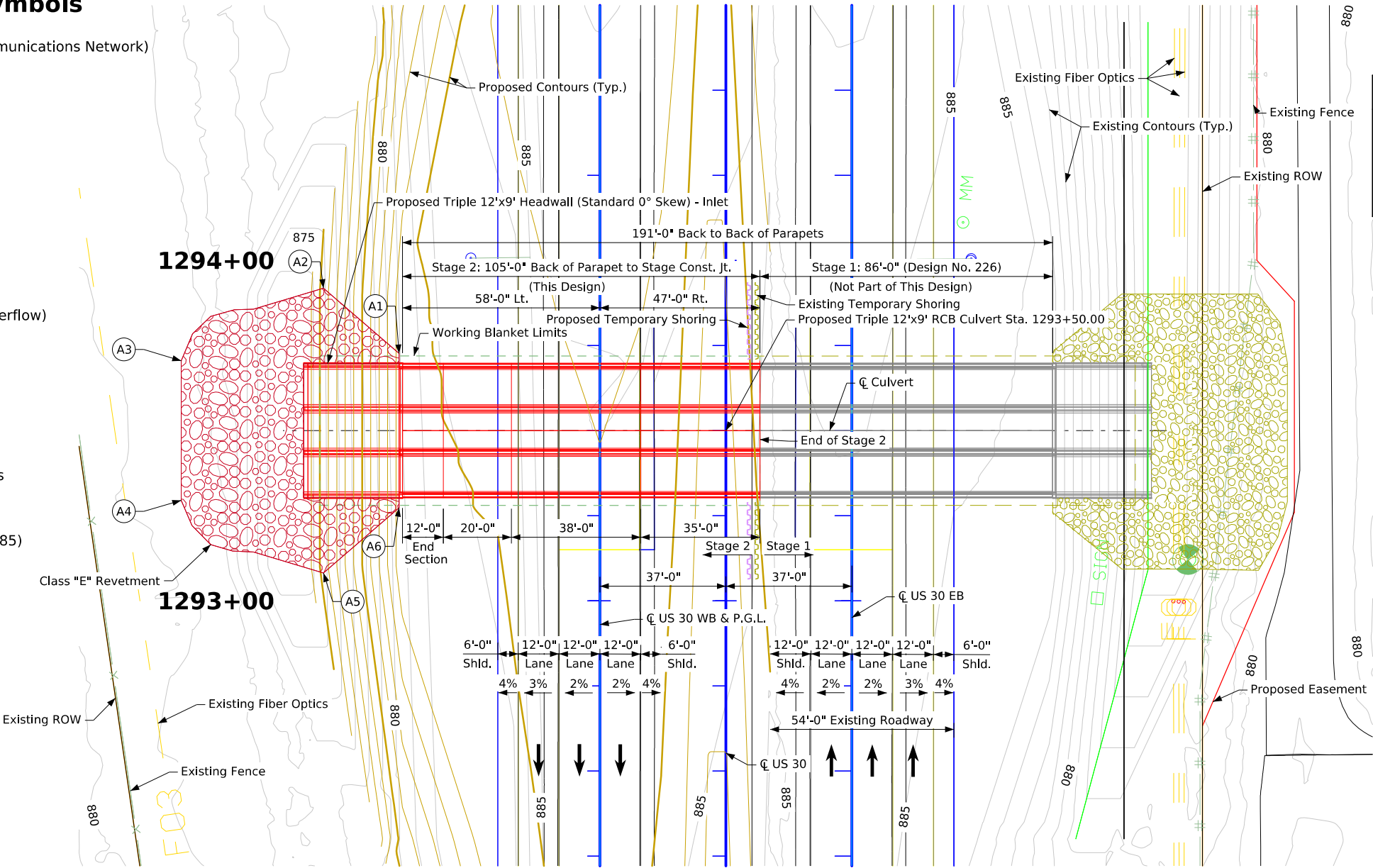
Q₁₀₀ = 1,430 CFS (23,500 CFS) *
HW Elev. = 883.0
Exit Velocity = 4.5 FPS

* Discharge in Parans. represents
total streamflow.

Refer to Design No. 227
(Project No. BRF-030-5(311)--38-85)
for general US 30 Crossing
Hydraulic Data.

Location

US 30 Over S. Skunk River
T-83N R-24W
Section 13
Washington Township
Story County
City of Ames
FHWA No. 701205
Bridge Maint. No. 8550.1S030
Latitude 42.005745°
Longitude -93.597376°



Situation Plan

Estimated Revetment Quantities

Location	Revetment Class "E" (Ton)	Engineering Fabric (SY)	Excavation Class 10, Channel (CY)
Inlet	370.6	542.0	247.1
Totals	370.6	542.0	247.1

Excavation quantity calculated from grading surface.

Proposed Revetment Data

Location	Station	Offset
A1	1293+72.67	96.00' LT
A2	1293+91.83	118.19' LT
A3	1293+70.48	160.00' LT
A4	1293+29.52	160.00' LT
A5	1293+08.17	118.19' LT
A6	1293+26.50	96.00' RT

Revetment data elevations reflect the grading surface.

Notes

All units are in feet unless otherwise noted
or shown.

See tied road plans, Project No.
NHSX-030-5(310)--3H-85 for additional
information on proposed grading limits.

NBI Structure Length = 37.5'

Design For 0° Skew
Triple 12' x 9' x 191'-0" (105'-0" Stage 2)
Cast-In-Place RCB Culvert

Situation Plan

STA. 1293+50.00 (US 30) Turn-in Date: August 2026

Story County

IOWA DEPARTMENT OF TRANSPORTATION
Design No. 727 Design Sheet No. 4 of 4 FHWA No. 701205

GEOTECHNICAL DESIGN



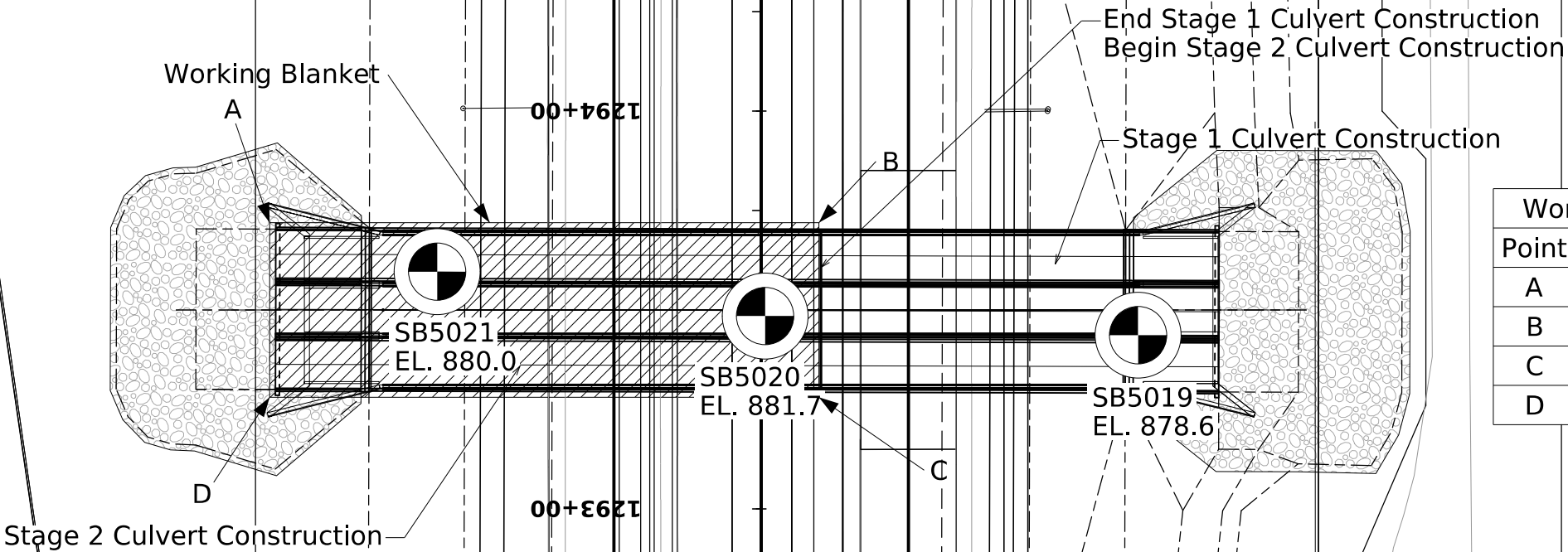
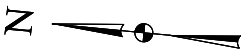
I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

Signature: *Adam Tyler* Date: 06/15/2026
Adam Tyler
Printed or Typed Name
My license renewal date is December 31, 2027

Pages or sheets covered by this seal: SPS.1 & SPS.2

THIS SHEET IS INCLUDED TO SHOW SOIL INFORMATION. DETAILS AND NOTES SHOWN ELSEWHERE IN THESE PLANS SHALL BE USED FOR STRUCTURE CONSTRUCTION.

Install a 1-foot thick Working Blanket directly below the cast-in-place RCB culvert, extending from within 3 feet of each proposed curtain wall, and to a distance of at least 2 feet beyond the sides of the proposed culvert as measured from inside face. The Working Blanket shall consist of Granular Material for Blanket. With a precast culvert alternate, the 1-foot thick Working Blanket shall be placed directly below the Granular Leveling Material. The Working Blanket may also be altered or deleted if determined to be unnecessary at the time of construction. The Working Blanket is not shown in profile view. Refer to Working Blanket Coordinate Table for approximate plan limits.



Working Blanket Coordinate Table		
Point	Station	Offset
A	1293+28.08	LT.124
B	1293+28.08	RT.15
C	1293+71.92	RT.15
D	1293+71.92	LT.124

Location

US 30 Over S. Skunk River Overflow
T-83N R-24W
Section 13
Washington Township
Story County
City of Ames
FHWA No. 701205
Bridge Maint. No. 8550.1S030
Latitude 42.005745°
Longitude -93.597376°

Design For 0° Skew
**Triple 12'x9'x191' (105'-0" Stage 2)
Reinforced Concrete Box Culvert**

Soil Profile Sheet

STA. 1293+50.00 (US 30)

Story County

IOWA DEPARTMENT OF TRANSPORTATION

Design No. 727 Design Sheet No. 1 of 2 FHWA No. 701205

Boring No.	Date Drilled	GroundWater Level (Ft.)
SB5019	04/01/24	NA*
SB5020	11/21/23	20.0'
SB5021	04/01/24	NA*

Existing grade line

Stage 2 Culvert Construction

(A)-TOPSOIL

(B)-DARK BROWN TO GRAY,
STIFF,
CLAY,
WITH SAND,
TRACE GRAVEL AND ORGANICS
(ALLUVIUM)

(C)-BROWN,
LOOSE, FINE TO COARSE-GRAINED
POORLY GRADED SAND,
TRACE GRAVEL
(ALLUVIUM)

(D)-GRAY,
MEDIUM DENSE,
FINE TO COARSE-GRAINED,
CLAYEY SAND,
WITH POSSIBLE COBBLES,
TRACE GRAVEL
(ALLUVIUM)

(E)-GRAY,
LOOSE TO MEDIUM DENSE,
FINE TO COARSE-GRAINED,
POORLY GRADED SAND WITH SILT,
TRACE GRAVEL
(ALLUVIUM)

Layer	Thickness
A	1.0'
B	5.0'
C	12.0'
D	5.0'
E	12.0'

(B)-GRAY TO DARK GRAY,
CLAY,
WITH SAND SEAMS
(FILL)

(C)-BROWN,
LOOSE,
FINE TO COARSE-GRAINED,
CLAYEY SAND
(ALLUVIUM)

(A)-TOPSOIL

(C)-BROWN,
LOOSE,
FINE TO COAR
POORLY GRAD
TRACE GRAVE
(ALLUVIUM)

(D)-GRAY,
MEDIUM DENSE,
FINE TO COARSE-GRAINED
CLAYEY SAND,
POSSIBLE COBBLE
(ALLUVIUM)

Stage 1 Culvert Construction

DPSOIL

(B)-DARK BROWN, MEDIUM, CLAY, TRACE SAND AND ORGANICS (ALLUVIUM)	
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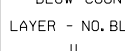
F.L. Elev. =873.50

(E)-GRAY,
LOOSE TO MEDIUM DENSE,
FINE TO COARSE-GRAINED,
POORLY GRADED SAND WITH SILT,
TRACE GRAVEL
(ALLUVIUM)

Layer	Thickness
A	1.0'
B	4.0'
C	11.5'
D	5.5'
E	13.0'

Layer	Thickness
A	1.0'
B	5.0'
C	8.0'
D	8.0'
E	18.0'

SHELBY TUBE CORE DATA	
CORE NO.	SB5020-B2 (6.0'-8.0')
CLASSIFICATION (AASHTO)	-
COEFF. CONSOL. FT2/DAY	-
TRIAxIAL COMPRESSION	-
COHESION, C - PSF	500
FRICTION ANGLE, f - Degrees	27
MOISTURE CONTENT %	28
DENSITY - PCF	95
UU - UNCONSOLIDATED & UNDRAINED	
CU - CONSOLIDATED & UNDRAINED	
UC - UNCONFINED COMPRESSION (COHESION = 1/2 UC STRENGTH)	

	WATER		LEGEND		
	DRY				
	PLUGGED				
	MOISTURE				
	SHELBY				
	BLOW COUNT		DIAMOND CORE		SOIL REMEDIATION AREA
	DENS. CORE		SAND		LIMESTONE (LS.)
	SAMPLE		GRAVELLY SAND		BROKEN & WEATHERED LS.
			BOULDERS		SANDSTONE
					SHALE
					SANDY SOIL

Soil Profile Sheet

STA. 1293+50.00 (US 30)

Story County

IOWA DEPARTMENT OF TRANSPORTATION

Design No. 727

Design Sheet No. 2 of 2

FHWA No. 701205

FILE NO. 32491

ENGLISH

DESIGN TEAM WHKS/Braun Intertec

Story COUNTY

PROJECT NUMBER NHSX-030-5(312)--3H-85

SHEET NUMBER SPS.2