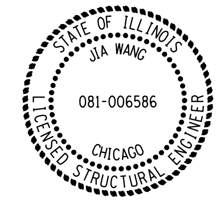
Benchmarks -

Existing Structure - Structure No. 060-3022, built in 1956 and reconstructed in 1994, is a three-span voided deck beam structure. The back-to-back of abutments measures 108'-2" and the out-to-out measures at 41'-0". Existing structure is to be removed.

Traffic Control - The new structure will be constructed in stages on existing alignment. One-way traffic will be maintained on existing structure during construction.

No salvage.



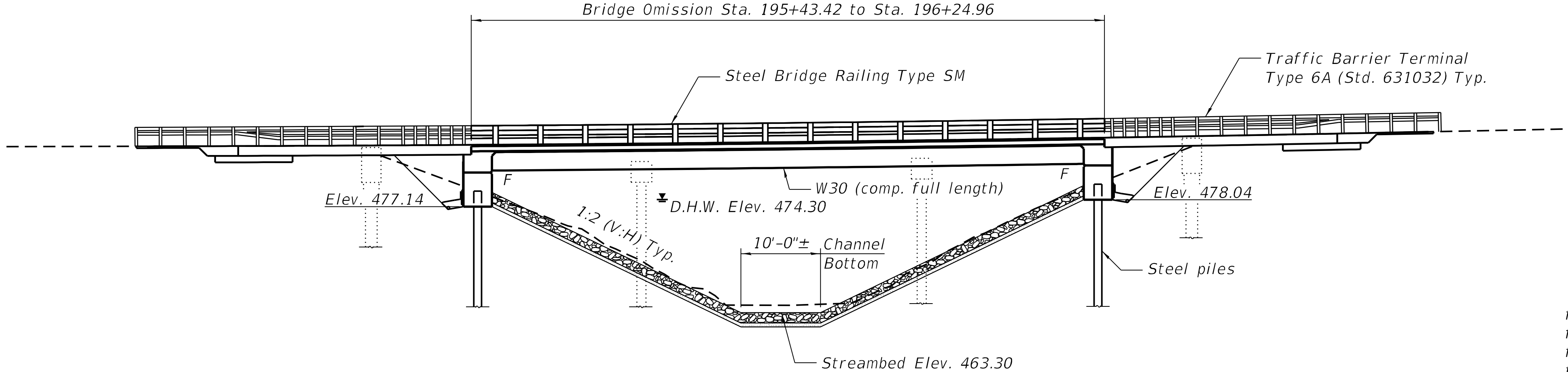
I certify that to be the best of my knowledge, information and belief, this bridge design is structurally adequate for the design loading shown on the plans. The design is an economical one for the style of structure and complies with requirements of the current "AASHTO LRFD Specifications."

Signed:

Dated: 05/26/2021

Illinois Structural Engineer
No. 081-006586
License Expires: 11-30-2022

INDEX OF SHEETS



ELEVATION

DESIGN STRESSES

FIELD UNITS

f'c = 3,500 psi
f'c = 4,000 psi (Superstructure concrete)
fy = 60,000 psi (Reinforcement)
fy = 50,000 psi (M270 Grade 50)

SEISMIC DATA

Seismic Performance Zone (SPZ) = 2
Design Spectral Acceleration at 1.0 sec. (SD1) = 0.173g
Design Spectral Acceleration at 0.2 sec. (SDS) = 0.440g
Soil Site Class = C

LOADING HL-93

Allow 50#/sq. ft. for future wearing surface.

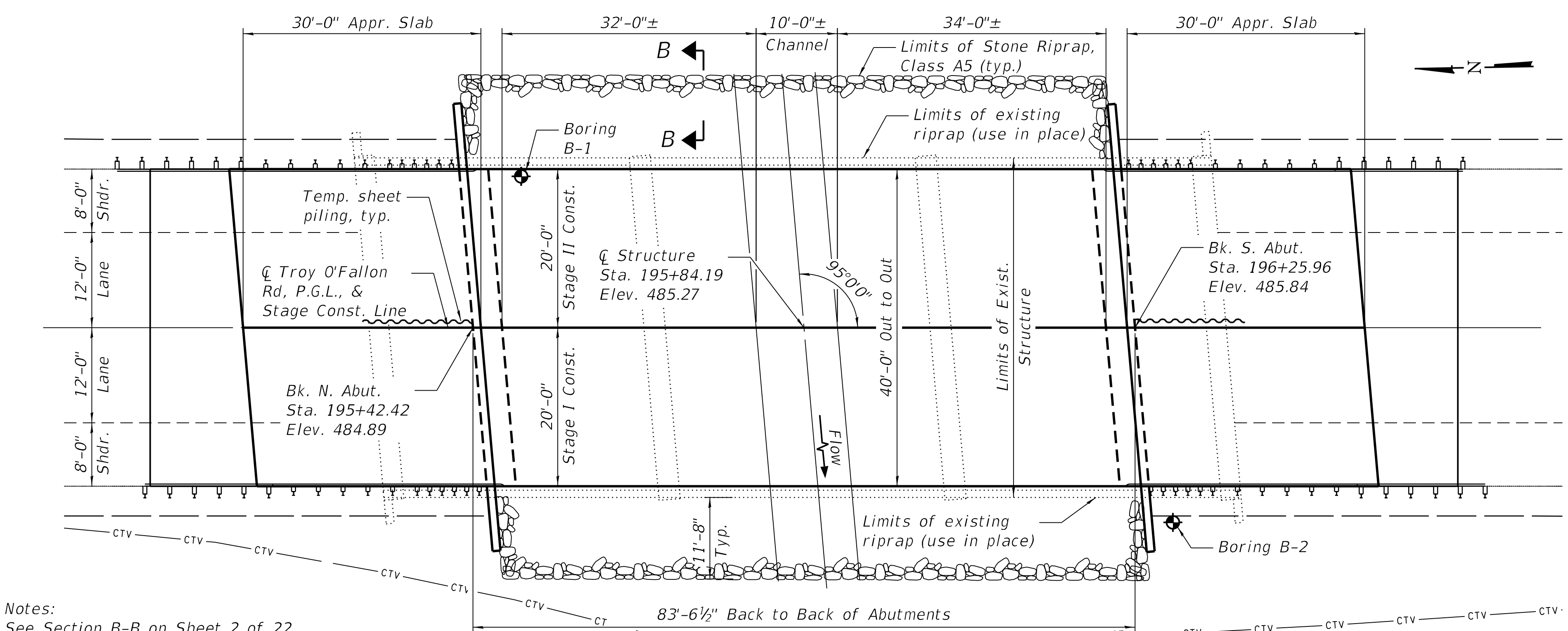
DESIGN SPECIFICATIONS

2020 AASHTO LRFD Bridge Design Specifications, 9th Edition

BRIDGE RATING (HL-93)

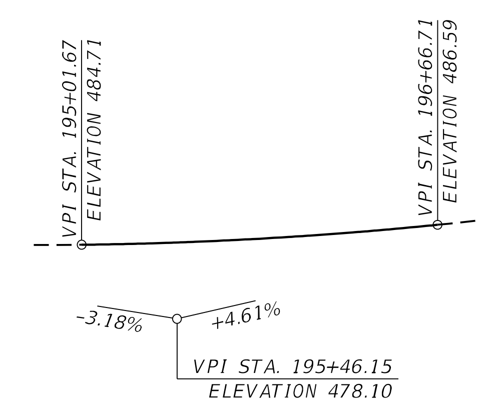
Inventory = 1.14 (STR I)
Operating = 1.48 (STR I)

1 2



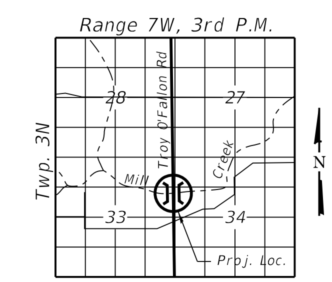
Notes:
See Section B-B on Sheet 2 of 22.

PLAN



PROFILE GRADE
(Along ℄ Troy O'Fallon Rd)

LEGEND
Soil boring



LOCATION SKETCH

GENERAL PLAN & ELEVATION
F.A.U. ROUTE 9393/FAS 1937 (TROY O'FALLON RD)
OVER MILL CREEK
MADISON COUNTY
STATION 195+84.19
STRUCTURE NO. 060-3373

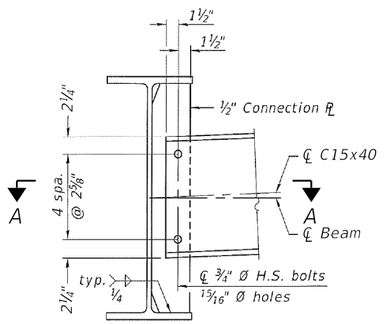
MODEL: Default
FILE NAME: P:\20-1124.00 Mill Creek Bridge\0_IDOT\Structures\001_General Plan & Elevation.dgn

Kaskaskia Engineering Group, LLC	USER NAME = mcohen	DESIGNED - MLC	REVISED 1 5/20/2021 JW	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION	GENERAL PLAN & ELEVATION STRUCTURE NO. 060-3373	F.A.S. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		CHECKED - JW	REVISED 2 5/26/2021 JW			1937	18-00084-04-BR	MADISON	39	18
	PLOT SCALE = 20.0000 ' / in.	DRAWN - NDP	REVISED -					CONTRACT NO. 97755		
	PLOT DATE = 3/19/2021	CHECKED - JW	REVISED -		SHEET 1 OF 22 SHEETS		ILLINOIS FED. AID PROJECT			

05/26/21 8:57:35 AM

INTERIOR BEAM MOMENT TABLE		
		0.5 Sp.
I_s	(in^4)	9200
$I_c(n)$	(in^4)	23645
$I_c(3n)$	(in^4)	17382
S	(in^3)	600
S (n)	(in^3)	849
S (3n)	(in^3)	771
DC1	(k/')	0.966
M_{DC1}	('k)	770.7
DC2	(k/')	0.078
M_{DC2}	('k)	62.5
DW	(k/')	0.489
M_{DW}	('k)	389.9
LLDF		0.612
M_{L+IM}	('k)	1259.9
M_u (Strength I)	('k)	3831.1
$\varnothing_f M_n$	('k)	4165.7
f_s DC1	(ksi)	15.4
f_s DC2	(ksi)	1.0
f_s DW	(ksi)	6.1
f_s (L+IM)	(ksi)	17.8
f_s (Service II)	(ksi)	45.6
$0.95R_hF_{yf}$	(ksi)	47.5
V_f	(k)	27.5

BEAM REACTION TABLE			
		Abutments	
		Interior	Exterior
LLDF		0.775	0.610
OCF		-	1.017
R_{DC1}	(k)	38.6	31.6
R_{DC2}	(k)	3.1	3.1
R_{DW}	(k)	19.5	19.5
R_L	(k)	59.0	55.3
R_{IM}	(k)	16.3	13.0
R_{Total}	(k)	136.5	122.6



INTERIOR DIAPHRAGM D

(15 Required)

Notes:
1. Two hardened washers required for each set of oversized holes.
2. Alternate channels of equal depth and larger weight are permitted to facilitate material acquisition. Alternate channels if utilized, shall be provided at no additional cost to the Department.
3. See interior Diaphragm/Cross-Frame Framing Details for connection plate orientation.

I_s, S_s: Non-composite moment of inertia and section modulus of the steel section used for computing f_s(Total-Strength I, and Service II) due to non-composite dead loads ($in.^4$ and $in.^3$).

$I_c(n)$, $S_c(n)$: Composite moment of inertia and section modulus of the steel and deck based upon the modular ratio, "n", used for computing f_s(Total-Strength I, and Service II) due to short-term composite live loads ($in.^4$ and $in.^3$).

$I_c(3n)$, $S_c(3n)$: Composite moment of inertia and section modulus of the steel and deck based upon 3 times the modular ratio, "3n", used for computing f_s(Total-Strength I, and Service II) due to long-term composite (superimposed) dead loads ($in.^4$ and $in.^3$).

DC1: Un-factored non-composite dead load (kips/ft.).

M_{DC1}: Un-factored moment due to non-composite dead load (kip-ft.).

DC2: Un-factored long-term composite (superimposed excluding future wearing surface) dead load (kips/ft.).

M_{DC2}: Un-factored moment due to long-term composite (superimposed excluding future wearing surface) dead load (kip-ft.).

DW: Un-factored long-term composite (superimposed future wearing surface only) dead load (kips/ft.).

M_{DW}: Un-factored moment due to long-term composite (superimposed future wearing surface only) dead load (kip-ft.).

M_{L+IM}: Un-factored live load moment plus dynamic load allowance (impact) (kip-ft.).

M_u (Strength I): Factored design moment (kip-ft.).
$1.25\ (M_{DC1} + M_{DC2}) + 1.5\ M_{DW} + 1.75\ M_{L+IM}$

$\varnothing_f M_n$: Compact composite positive moment capacity computed according to Article 6.10.7.1.

f_s DC1: Un-factored stress at edge of flange for controlling steel flange due to vertical non-composite dead loads as calculated below (ksi).
M_{DC1} / S_{nc}

f_s DC2: Un-factored stress at edge of flange for controlling steel flange due to vertical composite dead loads as calculated below (ksi).
$M_{DC2} / S_c(3n)$

f_s DW: Un-factored stress at edge of flange for controlling steel flange due to vertical composite future wearing surface loads as calculated below (ksi).
$M_{DW} / S_c(3n)$

f_s (L+IM): Un-factored stress at edge of flange for controlling steel flange due to vertical composite live plus impact loads as calculated below (ksi).
$M_{L+IM} / S_c(n)$

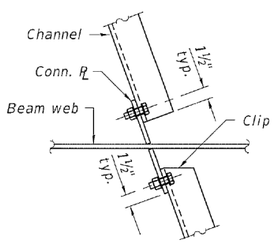
f_s (Service II): Sum of stresses as computed below (ksi).
$f_{SDC1} + f_{SDC2} + f_{SDW} + 1.3\ f_{L+IM}$

$0.95R_hF_{yf}$: Composite stress capacity for Service II loading according to Article 6.10.4.2 (ksi).

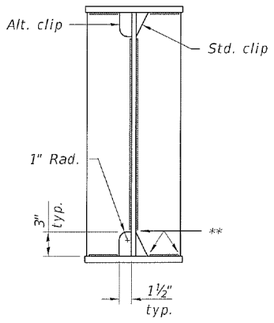
fs (Total)(Strength I): Sum of stresses as computed below on non-compact section (ksi).
$1.25\ (fsDC1 + fsDC2) + 1.5\ fsDW + 1.75\ fs(L+IM)$

Øf Fn: Non-Compact composite positive or negative stress capacity for Strength I loading according to Article 6.10.7 or 6.10.8 (ksi).

Vf: Maximum factored shear range in composite portion of span computed according to Article 6.10.10.



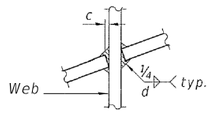
SECTION A-A



WELD LIMITS AND CLIP DETAILS

Interior beam shown, exterior beam similar

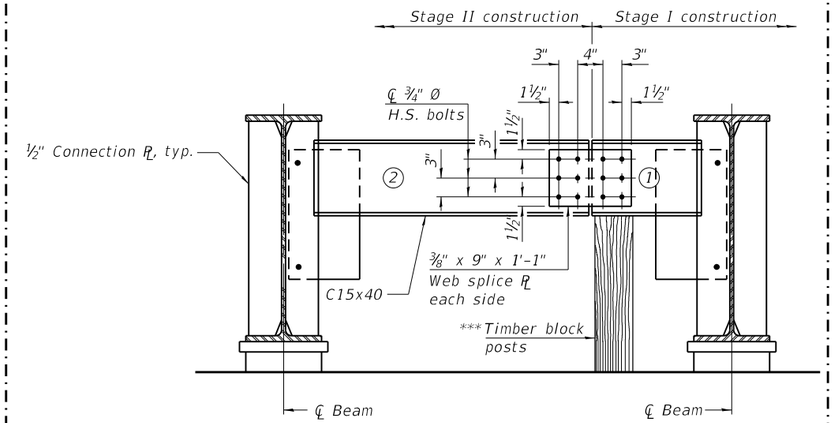
** Stop welds ¼" (±⅛") from edges as shown. Typical.



WEB WELD DETAIL

$d = ¼ + c$

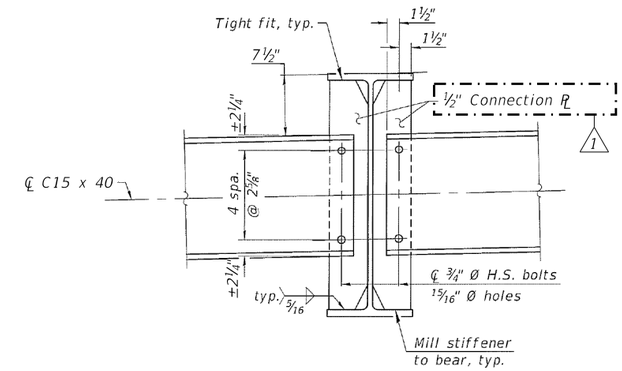
***Cost of Timber Block Posts is included with Structural Steel.



END DIAPHRAGM

END DIAPHRAGM STAGE CONSTRUCTION SEQUENCE

1.) Order diaphragm in two sections.
2.) Attach section (1) of diaphragm to beam.
3.) Place timber block posts between section (1) of diaphragm and abutment bearing section.
4.) Attach section (2) of diaphragm to both beam and section (1) of diaphragm during stage ii construction with splice plates.
5.) Remove timber block posts.



END DIAPHRAGM D1

(10 Required)

Notes:
1. Two hardened washers required for each set of oversized holes.
2. Alternate channels of equal depth and larger weight are permitted to facilitate material acquisition. Alternate channels if utilized, shall be provided at no additional cost to the Department.
3. See Diaphragm/Cross-Frame Framing Details for connection plate orientation.

MODEL: Default
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Kaskaskia Engineering Group, LLC
200 E. Main St., Suite 100, Belleville, Illinois 62220, 618.233.1077 phone, 618.233.1955 fax, www.kaskaskiaengineering.com
PROFESSIONAL REGISTRATIONS: Illinois Professional Design Firm 184.004773, Professional Engineering Group 20-5000586, LICENSE NO.

USER NAME	= mcohen	DESIGNED	- MLC	REVISED	1 5/20/2021 JW	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION	STRUCTURAL STEEL DETAILS STRUCTURE NO. 060-3373
		CHECKED	- JW	REVISED	-		
PLOT SCALE	= 2.0000 ' / ft.	DRAWN	- NDP	REVISED	-		SHEET 16 OF 22 SHEETS
PLOT DATE	= 3/19/2021	CHECKED	- JW	REVISED	-		

F.A.S. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
1937	18-00084-04-BR	MADISON	39	33
		CONTRACT NO. 97755		
		ILLINOIS	FED. AID PROJECT	