

Appendix D

LOG OF LIBBY BRIDGE, COMPILED BY MAJOR WILLIAM C. CARTER, JR., OPERATIONS OFFICER, 84TH ENGINEER CONSTRUCTION BATTALION (22 NOVEMBER 1952-5 JULY 1953) AND MAJOR SAM E. FAIRCHILD, HIS PREDECESSOR IN THAT POSITION

LOG OF LIBBY BRIDGE

9 October 1952

Notified by 2d Engineer Construction Group that the 84th Engineer Construction Battalion would build a high-level permanent-type bridge at X-Ray site on the Imjin River. Design and details forthcoming.

14 October 1952

A list of equipment and special materials is being prepared, that will be needed to build bridge. A reconnaissance of Battalion bivouac area is being made in the vicinity of X-Ray Bridge site. Plans are being made to move Company A, Company C, and H&S [Headquarters and Service] Company to this proposed location.

Submitted tentative equipment list to Group C.O., and he suggested that plans be made to utilize as much [as possible] of the equipment now in use or will be in use at Teal low-level bridge.' At present we don't know when the X-Ray Bridge job will start. Have not received any plans to date.

15 October 1952

Got O.K. from 1st Marine Division to occupy area near X-Ray site. Were told this battalion must construct "bug-out" road in rear of area. Now, have area swept for mines before starting preparation of area for quarters.

23 October 1952

Group shipped by rail 21 pieces of 60' sheet piling with different design from original type we had already received. Are unloading at Munsan[-ni] siding and holding for disposition.

25 October 1952

Got verbal notification from **Gp.-4²** that the following equipment was being shipped from Pusan:

2	Primary Rock Crushers	1	Aggregate Heating Plant
2	Secondary Rock Crushers	3	Shower Units
7	14 S Mixers ³	18	20' × 40' Tarps
4	Dozers	4	Herman Nelson Heaters ⁴
1	Two-compartment Aggregate Plant		

27 October 1952

Received plan #A-1-39, showing center line and plot plan of **X-Ray** site. Received profile, drawing #A-1-39 for proposed **X-Ray** [Bridge].

28 October 1952

Received Group Operation Order on **X-Ray** High-Level Bridge, #84-376.⁵

29 October 1952

Started assembling floats to drive **Armco piles⁶** upstream from piers to get bedrock profile and also to support cable fastening.

1 November 1952

Marines clearing mines in vicinity of near shore approach to bridge. Preparation being made to drive two **Armco piles** (one on each side) to support cable across river and to drive one pile opposite each proposed pier approximately 175 upstream to obtain bedrock profile in river bottom and also to be used as anchor piles to drive caissons.

9 November 1952

Completed driving two **Armco** cable anchor piles across river and strung anchor cable.

Received plans for permanent high-level bridge. The following questions came up: Is $3\frac{1}{4}$ " enough thickness for concrete deck slab which uses 1" width of reinforcing rods? Whether or not the

corrugated **sheet metal** on decking will be overlapped laterally? How many fixed and how many free ends of 36" beams? A detail of **free** end of beam? The size of pier base? The height of column section? The number of **reinforcing** rods in section **C-C'** column? Whether or not **the** base of pier went to bedrock?

Also received bill of materials from 2d Group for bridge. This was returned to Group for correction.

10 November 1952

Drove test **Armco** piles 125' upstream opposite pier 7 and pier 6. These piles to be used as test for depth of bedrock and also [as] anchors for caisson construction. [We obtained the following **re-** **results:**]

	<u>#6</u>	<u>#7</u>
Length of pile:	38 feet	38 feet
Time:	1650	1140
Depth of river:	9 feet	6½ feet
Penetration below river bottom:	20 feet	17 feet
Total below water [surface]:	[29 feet]	23½ feet

[Additional results:]

	<u>#3</u>	<u>#4</u>	<u>#5</u>
Depth of river:	8½ feet	8½ feet	9½ feet
Penetration below river bottom:	20½ feet	21½ feet	18½ feet

11 November 1952

Received corrected (change 1) copy of 2d Group's BM [bill of materials] on X-Ray Bridge. This was checked by Battalion against plans and changes recommended to Group.

12 November 1952

Checked with Group on plans and BM. **Refer** to questions listed above on 9th and 11th Nov. No answer was given by Group on deck slab or corrugated sheet metal. They are trying to get more data on metal. Group issued another sheet of plans (profile) showing which joints were fixed and which were free. Didn't give a detail of **free** end joint.

It was **O.K.** by Group to use new dimensions for the base of the

pier as resulted by actual measurements of type III sheet pile—giving 1 ft. increase in length and 1 ft. increase in width.

The heights of column sections were given and marked on the plans.

The number of reinforcing rods in cross-section of column C-C on plans was established as 22. Inserting 2 more on drawing.

The base of pier was to go to bedrock.

No decision was made on H-beams being used to anchor base of pier into bedrock.

No decision was made as to whether erection plates would be placed or just the bolts before pouring the base of the pier.

Group O.K.'d the additional changes of BM and issued a corrected copy (change II) of BM.

17 November 1952

Notified by Battalion S-4⁸ that 45# 15" channel iron was not available as called for on X-Ray BM. Called Maj. [Willard] Norris (Gp. [S-13]) and he said to go ahead and req[uisition] 15" channel leaving off weight. He said if 33.9# iron is substituted it would be O.K.

Capt. Long at Group is designing a sheet pile driving head that will drive 2 piles at a time. This may call for redesigning template for driving caisson.⁹

24 November 1952

Group notified Battalion last night that batch plant is not on hand at Pusan and 27 E mixers not available.

Major items now on hand include one 300 BBL [300 barrel] cement batch plant complete. One 80 to 150 [tons per hour] aggregate dryer arrived Munsan-ni this A.M. to be unloaded P.M. Sheet piling arriving on job. Work progressing on causeway, both banks.

A Company began erecting large maintenance building on 23 Nov. Area muddy due to freeze and thaw action. Trucks hauling rock base for X-Ray equipment yard, roads, and buildings.

25 November 1952

Aggregate dryer does not have UD 14A power. [generating] unit with the unit. Maj. Norris, Group S-3, [was] advised by phone, [by] Carter,¹⁰ about 1730 24 November.

27 November 1952

Col. [Raymond W.] Beggs, Group Commanding Officer, visited Battalion 26-27 November returning 10 A.M. today. Discussed plans for executing X-Ray project w/general approval given for all plans except modification of aggregate loading into dryer and method of mixing and placing concrete in caissons. About 1730 26 November Col. Egglestan¹¹ informed Col. Beggs that a 34 E paver was expected in Inch'on from Yokohama 11 December.

Present plans are as follows:

Progress schedule as per drawing 376-1, sheet 2, dated 26 November 1952, approved verbally.

Plans [are] to construct straight-line gravity-follow concrete mix plant along cliff on west bank then move to east bank and remove on completion of piers and before spring high water.

Plan to batch aggregate in plant but to mix and place concrete in caissons from three $\frac{1}{2}$ -cu.-yd. mixers arranged near caisson. Haul batch in 3-compartment dump body. Place concrete in caisson from $1\frac{1}{2}$ yd. clam bucket.

Corral concrete curing cabins¹² will be used to both cure fresh concrete and as a work platform to place concrete. Also as a shelter when fitting forms and placing reinforcing steel.

20' x 54' shed for concrete storage arrived today by trailer.

10 December 1952

Col. Beggs visited during lunch 9 December and gave decision on caisson pile dimensions as follows: 19 piles length and 5 piles wide plus corner pile 4 corners.

At 1700 hrs. talked with Capt. Long, Gp. Equip. O.,¹³ and was advised: UD 14A power unit for aggregate dryer being airlifted to K-16.¹⁴



Figure 64. Major William C. Carter, Jr., project manager for construction of the Libby bridge, in front of the completed structure.

Aggregate Elevator is on a boat from **YED**.¹⁵ Rotary drill is coming—don't know where or when. Batch plant less scales is shipped via rail [from] Pusan. Sheet pile heads-3 ea.—**adapter**¹⁶ ready 11 or 12 December.

10 December 1952

Aggregate plant at Marine Bridge consisting of one primary, two secondaries, went into effective production this **afternoon** after 4 days of **trials** and adjustments. Output indicated excellent coarse aggregate with doubtful fine aggregate due to unknown amount of fines and suspected silt and/or colloidal matter. Test samples picked **off conveyor discharge** this A.M. about **1130** and again about 1430, **were** taken back by 2d Gp. for sieve analysis along w/specimen **from** Imjin River sand.

Concrete batch plant in 3d day of erection on far shore. 20' × 54' cement shed **going** up on near shore. Equipment shop completed and roof going on carpenter shop. Materials yard about 1/2 laid out with approximately 8 trailer loads of lumber on hand.

Marine Bridge gravel appears unlimited with 20,000 cu. yd. take possible within easy 8 [cubic] yd. pan range of plant? Plant is fed by dozer and ramp bulkhead. Shovel loading out gravel fill to X-Ray yard.

Fender sheet pile on West causeway going in to protect **channel** erosion of causeway. **X-Ray** pontoon bridge removed 9 December.

17 December 1952

Staff visit by Col. Egglestan, Col. Norris,¹⁸ Capt. [Edward P.] Klotch, Gp. Ex. Officer, S-3, S-4, respectively, was made 14-15 December. Conference concerning Teal, **Freedom Gate**, and X-Ray problem was night of 14 December in Commanding Officer's tent. Among problems discussed concerning **X-Ray** were the following:

1 1/2 [cubic] yd. [power shovel] now at Teal will be required there through January taking off slopes of North approach **after** bridge steel and piling are complete.

There was general discussion of aggregates for **X-Ray**. Initial sample from Marine Bridge plant taken about 8 December shows 8.5 fines passing #80 screen.¹⁹ The sand appears to have an excess of clay and silt, and coarse contains a large quantity of sand and in

addition is coated with some clay and silt. It was generally believed that material passing through dryer would burn off and blow off some of the fines. Washing is not desirable due to expected low temperatures. Aggregates at Teal are generally cleaner than those at Marine Bridge. Dump truck support was discussed. It was generally agreed that river sand from X-Ray would serve the purpose, but it tests out 62.9% retained on #40 and 31.2% retained on #60 screen.

Equipment forecast by Gp. as of 14 December was as follows: 34 E paver-Inch'on-24 December phoned in by Maj. [Leonard C.] Nash of Gp. Batch plant-have car number but don't know when it will arrive. Aggregate loader-conveyor on a boat from YED. UD 14A power unit for aggregate dryer was too big for airlift and is coming up by rail sometime. Rotary drill still at Pusan. Adapter heads for sheet piles will now be ready noon 16 December. Have had a one-two day ready report for more than a week now. The adapter head is necessary to set first pile and delaying the start of actual construction at X-Ray.

On 16 December a call to Capt. Long, Gp. Equipment Officer said pile adapters were to be ready at noon. Call back from Group says power failure has delayed completion to Thursday 18 December. Group Ex[ecutive] Officer informs that car number on batch plant turned out to be car number of car that brought up cement batch plant. No commercial batch plant will arrive in near future. Order given to Company A 16 December to proceed to construct our own plant. This has delayed concrete production several days.

17 December 1952, 1315 hrs.

Just talked with Lt. Col. Norris, Gp. S-3, and request dump truck platoon (16 trucks with supporting mechanics and supervisors) to report 19 December. To be housed H&S Co.

Norris reports two hours' work remaining on sheet pile anvil head. Will call when complete. Requests redesign of steps and rerequisition of material to be changed to X-Ray.

17 December 1952, 1715 hrs.

Group Ass't. S-3, Maj. Nash, has called and inform [ed us that] 16 dump trucks with drivers and support to arrive 19 December. Decision of Commanding Officer to move aggregate production plant from Marine Bridge to Teal. S-3 concurs. Marine Bridge

aggregate has too heavy a coating of silt and clay. Company A's rock crusher crews to move up on **18 December**.

18 December 1952

UD **14A** power unit for aggregate dryer arrived at Munsan rail head yesterday. Today at 1630 checked rail yard and found six **60-ton** aggregate batch bins had arrived.

Aggregate plant moved Marine Bridge to Teal on **17 December**. 16 dump trucks to arrive tonight to haul aggregate from Teal to far shore X-Ray.

Adapter head for sheet piles arrived last night. Too big. Spent day cutting it with torch down to size. If it fits can begin first actual construction on caissons tomorrow.

20 December 1952

At 0845 hrs. the 1½ yd. Manitowoc crane rigged with leads, **5000#** hammer, on West causeway near pier 6 picked up a **40'** sheet pile. As crane swung from W to S the machine began to tilt to the S. **Tracks** were on E-W axis. Maj. Carter, Capt. [Willard T.] Pflueger, W/O [Harry] Cooley were observing operation; all **hol-**tered simultaneously, "drop the hammer." Operator attempted & stop swing a second then jumped. Rig toppled sideways to **the S**. Damage appears to be broken boom section, twisted leads, twisted and broken catwalk. Damage to machine unknown but believed slight. Immediate efforts began to remove damaged sections and upright machine.

30 December 1952

X-Ray project progressing slowly. Pier 6 sheet piling going in with 6 piles to 15 penetration as of 29 December. First pile driven to 30' penetration from causeway to bedrock. Remaining piles to be driven to **15** until all are connected then to bedrock.

Concrete mix plant erection proceeding. A total of six **(6)** aggregate batch bins arrived: two to feed aggregate dryer, two in mix plant to feed volume measure buckets for each mix, two to be returned to. Gp. S-4 as excess.

Coarse aggregate production at Teal is slow. **80 cu.** yds. loaded out first day of operation. Frequent breakdown of crushing equipment. 595th [Engineer Dump Truck Company's] dump trucks **(16)** hauling aggregate from Teal to far shore X-Ray. **Trucks** as of today begin hauling sand from Spoonbill to far shore.

Excavation to elevation 53 [feet above mean sea level] proceeding on West abutment. Clay spades and pneumatic tools required for all excavation.

Carpenter shop completed and erection of concrete curing shelter underway. Materials storage yard laid out and organized. Operations Office carpenter work finished 29 December.

Company A and Company C hurting for manpower. Each company has men working to complete Teal.

Many items required for first concrete pour have not arrived. Gp. advised on 29 December of shortages.

11 January 1953

Status of project as of 1200 hrs. 11 January 1953 follows:

Sheet piles pier 6 all driven to within [at least] approximately 5' of bedrock with about $\frac{1}{3}$ to bedrock. Penetration averages 30' below causeway which is at about plus 15' MSL.²⁰ 2100 GPM pump²¹ with lowering attachments and hose is on site prepared to dewater. $\frac{3}{4}$ yd. clam is on site prepared to excavate. Piles will be cut to elev. 15.00 per change in caisson design from elev. 10 to elev. 15 necessitated because elev. 10 would be under water much of the time. Well drill rig on hand to drill dowel holes if bedrock surface is not rough enough to prevent movement of caisson.

Central concrete mix plant is set up and awaits 34 E paver. Paver has been reported for more than two weeks as on the way, at Pusan, on water between Pusan and Inch'on, and in hold of ship at Pusan. Gp. S-4 advises as of an hour ago it is now on way via water to Inch'on. Aggregate dryer operated first time on 10 January. Water heater operated on 11 January.

All coarse aggregate required [is now] on far shore[;] 900 [cubic] yds. [are there], only 700 [are] required. Hauling as of this date to stockpile near shore. Sand stockpiled on far shore, and source on river downstream far shore available for further requirements.

West approach road laid out with a curve to the right on north with 5%+ grade and curve to south on left with 8% grade. 36" culvert going in at station 12+51.²² Slope stakes going in on approaches. Necessary stripping completed. Earth moving equipment must come from Teal on completion of that priority project.

West abutment nearing complete excavation to elev. 53 MSL. Gp. C.O., Col. Beggs says O.K. to not use form on abutment in view of rock condition of excavation. South wing wall will be

stepped to suitable foundation. No wing wall necessary on N side.

Timbers laid to carry 1½ yd. Manitowoc which will drive pier 7 and for 1½ yd. P&H which is enroute this date from Teal to drive pier 8. Pile in place.

Carpenter shop is working on first set of forms. Reinforcing rod fabrication is underway. Materials storage is fully operational. 48" built-up beams to begin arriving coming week after rail embargo lifts on 13 January, 8 per day. Cement on hand.

We are needing welding equipment and cutting torches but must wait until Teal finishes.

Excess supplies and equipment are being moved daily from Teal. Company A and Company C manpower at Teal partially released on 10 January.

Weather past ten days has ranged from 42° to 2° F. Only one day of real warm weather.

16 January 1953

Plans have been changed by Army and Gp. in some particulars. Superstructure deck will be 8½" thick from steel deck valley to top of pavement, 7" at curb. Construction joint between slab and curb. Lifts on pours, as planned by 84th and for which initial set of forms had been built, were changed on column portions to below 45° chamfer of 1' under stiffener and under cap.

Major changes made in wing walls, and Gp., Lt. Dameran²³ has been promising new design for 3 days now. We could have poured concrete tomorrow if plans had been finished. A trip to Gp. yesterday produced half the information required but no call today on steel, which will have to be cut and bent and placed.

34 E paver, less drum, arrived at Inch'on yesterday. We are going ahead with one 16 S mixer in central plant.

Piling going in fast on pier 7 today. 1½ yd. P&H crane moved down from Teal requires several critical parts before driving operations on pier 8 can proceed.

26 January 1953

Equipment deadlined and lack of equipment due to Teal priority continues to delay seriously X-Ray job. During past week we have critically needed 1½ yd. crane for pile driving, one day was lost for lack of an operational air compressor when 500 cfm clutch²⁴ went out, and two days were lost limping along with a 210



Figure 65. Excavation of cofferdam 6, begun by a $3\frac{1}{4}$ -yard clam bucket on 16 January 1953. Shower unit at lower left provided hot water for cement. Twelve inches of ice on the Imjin provided access to the far shore on foot.

cfm in lieu of 500. Teal is releasing equipment as fast as job permits.

Continuous problems arise with pumps. Ignition troubles due to lack of good spark plugs, points are main causes.

Three (3) $\frac{3}{4}$ yd. cranes are down for [piston] rod inserts. Passed by $\frac{3}{4}$ yd. Koehring day before yesterday just as inserts began to knock. Engine was full of oil. The clutch of the booster to boom hoist on 22B causes delays. Same crane needs new tracks. This machine has cost us valuable days in excavating caisson #6.

Lack of welding machines operational has held up completion of concrete batch plant. For a week only one welding rig at X-Ray and it was on pile driving rig or pier 6 most of time.

Steam rig 3 car heater²⁵ came up last Monday 19 January at night. Operator from 526th [Engineer Panel Bridge Company] had never seen the machine before and was useless. A bad tube has caused delay in proper use of rig. Believe it to be O.K. now.

Will place concrete in W abutment today if plant and $\frac{3}{4}$ yd. mobile Buckeye hold together. Buckeye broke down again last night. It will not travel due to clutch but can be thrown into gear.

Finished driving piling pier 7 yesterday to average penetra-

tion of 27'. Lack only one foot to refusal on average it is estimated. **Gp. C.O.** ordered **Bn. C.O.**²⁶ on 25th to drive only 5' all pile, excavate, place whaler,²⁷ drive again. This procedure will materially slow work over present procedure.

A bad crack in piling, pier 6, makes as much water as 2100 GPM can pump from elev. **4**²⁸ support in hole. Attempting to seal crack with grout from outside caisson using well drill rig.

27 January 1953

Placed concrete in West abutment and wing-wall footings yesterday. Finished placing at midnight. Began placing at 1700 hrs. First bucket with 2% calcium chloride and running **110°** set up in less than 30. min. **1-2-3 mix**²⁹ used. Water was about **40°**, cement **32°**, rock **125°**, sand plus **300°**. **Required** 17 gal. water, at times 18 gal., to get 2" slump.

Diver explored pier 6 caisson and reports crack between 2" and 3" to bottom. Attempted to put corner pile in to cover crack but did not succeed. Plan is to pump neat cement grout with well drill rig from outside when **differential** is **3'** water head flowing into caisson. Welder-diver to weld 2" angle iron over crack this P.M. Temperature of **9°** this A.M. caused **difficulties** starting motors.

Gp. C.O., **Col. Beggs**, on job last night and today. **Recommends** keeping engines running at night.

Hurting for more cats³⁰ to fill east causeway, approach road from east and cut slopes for B Company's bivouac area. Need more welders, Herman Nelsons, and cranes.

28 January 1953

Diver worked in caisson pier 6 today. P.M. was spent setting 2" angle iron down to rock against and covering crack. At 0200 this morning diver finally completed tack-welding angle iron in place. Today he is to weld tight.

Attempted to grout with neat cement from 29' down using well drill. Pumped better than 30 [one-cubic-foot] bags down when pump quit, lost prime. Will try again.

Have 22B working caisson **#6**. 2100 GPM pump, welding machine, 4" diaphragm pump, 55 GPM pump, **and** well drill rig tied up on pier 6.

Mobile ³/₄ yd. Buckeye w/clam excavating on pier 7 beginning 26 January. **1**¹/₂ yd. Manitowoc driving pile w/500 cfm pier 8.

Need more pumps, centrifugal, more welding machines and

cranes. 1½ yd. P&H rigging on near shore causeway to drive piles.

30 January 1953, 0750 hrs.

Job has been stymied as a result of pier 6. On 29 January a concrete cap was placed through a tremie into a form to block off a flow coming from under one of the piles that split. Apparently little water is coming in through the crack. Diver cleaned out bottom, placed cap form, set tremie. Diver reports bottom uneven and leaks only under piling capped off on 29th. On 30 January we will pump grout adjacent to split piling.

On 31 January we will attempt to dewater. If successful we will muck out and pour. If unsuccessful we will get divers, muck out, and pour.

Col. Beggs returned [to] his Hq. on 29th. Visit made 29th by Col. Kelly,³¹ 8th. Army Operations, and Col. Ribbs,³² 8th Army Engineer Section.

Col. [Louis J.] Rumaggi, 8th Army Engineer, ordered concrete be placed around bottom of caisson night of 29 January. C.O. advised Gp. C.O. of conversation. Job needs more cranes. 1½ yd. P&H rigged to drive on east causeway and should begin driving pier 1 today.

Rig pulled off of pier 8 on 29th and began driving pier 7 to penetration. Standard penetration accepted at 50 blows per quarter inch. This move was result of earlier Gp. C.O. order to drive down in increments and excavate and set whalers. This policy reversed on 29 January by Col. Beggs after a closer study of driving procedure and soil conditions.

Excavation of pier 7 will continue today after all piles reach penetration.

Army is vitally interested in depth of bedrock under caissons. Will drill down tomorrow when grouting [is] finished.

2 February 1953

The Army Engineer, Col. Rumaggi, and Col. Beggs visited the job yesterday. Col. Rumaggi, after having seen caisson, pier 6, remarked at noon to Col. Beggs, "We must consider all means necessary to fully investigate foundation conditions, at the risk of delaying the opening date [of the bridge], as neither you nor I wish to build a bridge such as this one that will fail."

Pier 6 was dewatered after time-consuming delays in getting

2100 GPM and 1000 GPM pumps lowered into hole and operational. Last night we stood on bottom of south end. Lots of water in split pile crack. Whaler now in bottom of pier 6. Col. Beggs says two Korean divers to come 2 February to muck out bottom. A slab will then be placed on rock bottom, allowed to set up two to three days, then finish placing concrete. Man killed³³ night of 31 [January]-1 [February] by boom failure on $\frac{3}{4}$ yd. Buckeye clam pier 7.

9 February 1953

Concrete was placed in pier 6 caisson beginning 5 February and ending 6 February at 1900 hrs. The hole continued to make water, and three large boils in the south end were evident when last mucking was completed. An air rock drill went 3' into rock near the southeast corner prior to placing concrete.

Before placing concrete 50 sacks of cement were emptied into the hole that was full of water at the time. The first 20 or so buckets of concrete were lowered with a $1\frac{1}{2}$ yd. clam which proved time-consuming and created a great deal of wash-wave action. A rig mounted on four wheels running on the top 12" H-beam whaler holding a 15" pipe by a collar served as a movable tremie which speeded up placing operations.

Pier 7 was quickly excavated to a depth of about 26 feet, but remaining excavation is slow. Mucking by hand due to large boulders. No rock positively evident as of 2000 hrs., 8 February.

34 E paver arrived on job night of 8 February.

Considering use of a "pumpcrete plant" to place all concrete. "Bug out fever" prevails past three days.

11 February 1953

Col. Beggs, 2d Gp. C.O., visited job on 10 February, inspected caisson #7, and ordered a concrete blanket placed in the bottom, up to top of bottom whaler. A matter of 4' of concrete. Allow to set two days, dewater, and attempt to place remainder in the dry. Bn. C.O. and S-3 favored and recommended placing entire caisson but were overruled.

34 E paver is being readied for operation.

Excavation on pier 8 is slow, mostly by hand and air tools due to frozen ground. Now down to rock.

Placed West abutment wing wall. Vibrator sheared cable after $\frac{1}{3}$ of pour placed. Rodded remainder into form increasing cement one bag per $\frac{1}{2}$ cu. yd.

Job badly needs two additional cranes, $\frac{3}{4}$ yd., to meet **schedule**. Vibrators are in critical category along with rivet hammer of **80-90 lb.** size.

Bn. C.O. approved scaffold design incorporating 3" angle iron kicking against 48" beam with hook holding top member to 48" beam.

B Company platoon is placing **48"** beams and beginning **disassembly** and assembly operations.

Adequate coarse aggregate is now on hand to finish job.

12 February 1953

Job was visited by Gen. Bowman, AFFE Engineer, % and party; Col. Kelly, 8th Army Engineer Section and party; and Col. Beggs, Gp. CO. Col. Beggs left instructions to attempt to dewater pier 7 after concrete blanket placed **11 February** has "set" two days and finish placing concrete. 34 E paver was used to place concrete in pier 7, pour A blanket, and worked satisfactorily. Method of placing was through a hopper mounted on **15" Armco** piling supported on a four-wheel expedient dolly. A "bung" [plug] was placed in pipe at bottom to prevent water entering pipe on orders of Gp. C.O. Method does not work successfully unless ready means is available to keep elevation of bottom of pipe at **exactly** desired height.

Job badly needs generators for night lights, welding machines, cranes. A crane is needed to aid in fabrication of steel, a crane is needed to erect curing cabin, and a crane is needed for excavating near-shore caisson.

Pumpcrete plant less miscellaneous pipe and accessories **arrived** last night. Job had two welding machines operable as of last night. At least ten can be profitably used.

12 February 1953, 1300 hrs.

C.O. just informs that Gp. called and adds the fifth beam to bridge. This means loss of past weeks' work in setting beams on far shore aligned for four-beam spacing.

13 February 1953

Gp. S-4 visited job with Gp. Equip; Officer and others. **Discussed** additional materials required as result of adding fifth beam to structure. Gp. S-4 says he has **TWY'ed** [cabled] Japan for items manufactured there.

Requested Gp. S-4 to ship all steel decking.

14 February 1953

Began placing concrete in dry hole, pier 8, about 2200 hrs., 13 February. As excavation proceeded on pier 8, rock was encountered at elevation **from 8' to 10'** down. The rock was rotten, fragmented, broken and weathered on top but moved out **comparatively** easily with clay spade. Sheet piles were undermined when bad material removed. On 13 February at about 1130 hrs. water broke through northeast corner in 200 GPM volume. Piles were tapped down with free 5000 lb. hammer, and 99% of leakage stopped. Foundation was mucked out again, washed down, and steel set. Foundation again washed down and all loose mud and muck removed. There appears a rough bedrock surface entire bottom. No slopes to the east are excessive or in a **plane** surface. The rock outcrops with an upward tilt to the south with the plane strata lying about **35°** downward and level east and west. This gives an excellent key to prevent slippage to the south.

All concrete was placed in the dry. Seepage water was moved ahead of concrete. Pour completed **1655** hrs. 14 February.

15 February 1953

Gp. C.O. visited job on 14 February and observed dewatering of pier 7 where concrete blanket approximately 4' thick had been placed. The top of the surface is soft, material has very little **cementitious** material. The top 2" to 5" is cement settlings and is consolidated but not fully set up. On digging down we find the material much harder, and more cement is with aggregate.

Gp. C.O. orders excavation of all loose material. Pier 6 **questioned**. Hold up work on pier 6 until decision is made. Mucking crews worked P.M. 14 February and night shift cleaning out loose material.

Job badly needs three more cranes and more generators and welding machines.

Lowboy³⁵ dispatched to Gp. S-4 today to pick up KNR [Korean National Railway] core drill rig to get core out of pier 6. . .

16 February 1953

Loose material free of required cement mucked out of pier 7. Material about **1'** under **surface** found to be suitable concrete in opinion of Bn. C.O. and Bn. **S-3**. Gp. C.O. advised A.M. of **15**

February and inspection requested, but Gp. C.O. could not come up until 16 February. Hole is heated and cleaned out awaiting approval.

Job is seriously delayed due to shortage of cranes. Cranes are needed to handle 48" beams, unloading and placing; crane is needed to load-aggregate bins; crane is needed to excavate pier 1; crane is needed to place concrete; crane is needed to assist in erecting forms, curing shelters, moving heavy objects, lowering pumps, and setting up for concrete operations. Available is $\frac{3}{4}$ yd. trk. mtd. [truck mounted] crane used on causeway, all jobs in priority.

Small pumps, 55 GPM and 166 GPM, are badly needed. Riveting hammers supplied have been too small (60 size) or inoperative (KNR). Fabrication of steel is a full week delayed as result.

17 February 1953

Lt. Damron advised to bend 6 dowel bars in pedestals on piers 6, 7, and 8 since 20 dowels were used instead of 22 called for on plans.

18 February 1953

Gp. C.O. authorized placing concrete in cofferdam pier 7 on A.M. of 16 February. Placing commenced at 1100 hrs. and was completed at 0130 hrs., 17 February. Concrete was placed "in the dry."

[On] 17 February 1953, bulkhead was placed near pier 7 for 34 E paver to discharge into **remixer** hopper of pumpcrete plant.³⁶ Plan now is pump concrete into piers 6, 7, 8 from central location.

Gp. C.O. authorizes 5' fall from bottom of pipe to level of placing in the form.

Core drill from KNR thru Gp. S-4 did not arrive.

Forms going into pier 6, B pour, and steel being placed; curing cabin going up on pier 8. Shortage of operational rivet hammers and cranes is hurting job.

18 February 1953

Lt. Damron advised that all dowel bars to have 90° bend, 5" or 6" long, since, $\frac{7}{8}$ " rods used instead of 1" rods.

18 February 1953

Lt. Damron brought up plans for 78th job at Tongduchon-ni

and delivered two sets of plans to Company B on location, also progress charts to be filled in and **returned**.³⁷

20 February 1953

Gp. C.O. called Bn. C.O. this date and ordered us to cease **placing** concrete pier 6 until a core sample was obtained.

Downstream column, pour B, was placed successfully with pumpcrete plant on 19 February. Plant, pipe, forms, and steel are ready for upstream column. Waiting for core will seriously delay this pier's completion.

Parts of KNR drill rig arrived yesterday and are being **assembled** today. It appears that KNR used a primitive drill rig. The power unit is now present. It appears that chilled shot is used to obtain a core. Just how the 4" pipe drill will "pull" or retrieve a core once cut is a mystery to me. I've seen core drills in operation on several jobs, but the core tube was of American manufacture and possessed "dogs"³⁸ **inside** the tube to hold as the core obtained.

The job is seriously suffering for want of $\frac{3}{4}$ yd. cranes. Cranes [are] needed to place 48" beams, unload piles and 48" beams, excavate pier 1, and aid in placing concrete, rigging, [and] forms in 6, 7, and 8.

Weather moderating today after a week of 0° to 10° weather.

21 February 1953

Gp. C.O. visited job briefly this A.M.

Two Korean drillers from a contractor's organization arrived to operate the KNR drill rig. Necessary parts missing from rig were determined by the drillers and Lt. Pak, **KATUSA w/2d Gp.**, and 84th will dispatch a truck to pick up necessary parts at 0800 hrs., 22 February, from Lt. Lee of 2d Gp. Cores obtainable will be approximately 2" [in] diameter. This is not a desirable size for a concrete core but must **suffice**.

Forms [for] B [pour], pier 8, being installed. Bad concrete on pedestals, pour A, pier 7, being jackhammered out. Concrete bad due to vibrators not being operational at time of placing this portion, and insufficient **rodding** was apparent.

$\frac{1}{2}$ yd. **Manitowoc** is setting steel on W approach. Riveting school **underway**. Four $\frac{3}{8}$ " rivets were delivered and four $\frac{1}{2}$ " ordered. The $\frac{1}{8}$ " is sufficient to give a bad head, and rivets must be returned.

Job needs cranes, vibrators, small pumps. Pumps appear to be our next bottleneck in placing concrete.

24 February 1953

Col. Ribbs, 8th Army Engr Section, is visiting job today. Discussed rivets versus bolts in **48"** beams due to poor quality of rivet stock and untrained crews w/no **buckers**.³⁹

B pour, pier 8, completed in 2 hrs. **15** min. yesterday without incident using pumpcrete plant.

Drill rig is down **6'-8'** and has produced **2"** of core out of pier 6. 'Setting forms and curing cabin on pier **7**.

Pier 1 excavated to elev. 3 and two piles E side are sprung and leak 400 GPM estimated.

Pile driving pier 2 proceeding nicely.

22B placed in operation last night w/new motor.

Ice too thin today for travel. Placed assault boat into service between causeways.

Began E approach today and had trouble breaking through frost.

East abutment excavated today w/dozer.

27 February 1953

Job was visited yesterday by Col. Beggs and Lt. Col. Parker, 34th Gp.⁴⁰ The KNR core drill barrel twisted off in the hole on 25 February and efforts to extract were futile. Side of curing cabin was removed and **Failing**⁴¹ well drill was set into position to drill. Drill is down 3' as [of] **0800 hrs.** today. **Col. Beggs** directs that we use rock bit to drill 20' taking sweepings every 5' and then attempt to take core rest of way. We will use an overshot with chilled shot to get core. If bottom is not consolidated, the plan as explained by Col. Beggs is to drill two holes inside caisson, drill holes outside caisson, pump grout. Redrill and if not consolidated we then drive piles 8' away from present piles, excavate, and fill w/concrete.

Split piles observed in pier 1 at elev. 0 on excavation were pulled. Pulled eleven piles on SE quarter, corner pile on SE and adjacent pile to corner. Resetting piles this A.M. Found piles warped on bottom as much as **18"**. Penetration blows cut back to **50 per 1/4"**.

Pour B, pier 7, placed yesterday, finishing at 1915 hours. **Successful** in' all respects.

Excavating to **elev. 58** on near shore approach as work site for structural steel. Abutment is excavated.

28 February 1953

Last concrete aggregate loaded out of Teal on **27** February. Hauling scrap dirty aggregate to X-Ray roads.

Drill rig drilling in base of pier **6** hit soft digging between **10'-11'** last night. Hole is down to **21'** and lots of sand washes into hole. Ordered curing cabin removed and upstream column **B** form removed. Will drill two holes inside two columns and put down wagon drill holes next to pile and attempt to consolidate by grouting.

Col. **O'Grady** decided to jackhammer pier **6** out, remove **all** concrete and sand, gravel, [and] cement, and repour by putting in a blanket on bottom, then placing in the dry. Former plan to consolidate by grouting will not be followed.

Company **A** will be assigned the job. Causeway will be extended from near shore when **7** and **8** are complete.

3 March 1953

Gp. C.O. visited job **28** February and asked for another test hole before we blow caisson pier **6**.

Gp. C.O. called **2** March and said Army Engr. has ordered caisson pier **6** be grouted.

KNR drill crew arrived late P.M. **2** March to retrieve core barrel and redrill hole. Riveters from KNR also arrived.

Rain night of **1-2** March left roads and work area very muddy.

C pour, pier **8**, completed **1930** hrs., **1** March.

Job needs additional lights for night structural steel fabrication and generator for same.

4 March 1953, 0640 hrs.

Col. Rumaggi and Col. Kelly visited job **3** March. No positive decision on action to follow on pier **6**. Wagon drill continuing.

Split piling pier **1** began pulling.

Four welding machines in **78th** for repair badly needed on structural steel.

KNR could not retrieve core barrel until additional tools were brought up. Will try again today.

4 March 1953, 0725 hrs.

C.O. advised at breakfast that Col. Beggs called last night and said "blow" pier 6 and excavate.

5 March 1953

Pour C, pier 7, was placed on 4 March without incident. Curing cabin, pier 8, was raised 15½ feet.

Pier 6 was drilled, 40% dynamite used to blow top portion of caisson and downstream column at 2225 hrs., 4 March.

Pier 1 piles pulled on NE corner have been reset and driven to penetration. Excavation for third time underway. All piles noted split have penetrated a strata of rock 8"-10" thick at about elev. 2 MSL. All have been type. 111 Yawata⁴² unpointed piles that do not groove as well as those [of the] same type that come pointed.

Penetration driving continues on pier 2.

Shortage of operational welders is hindering progress on steel fabrication.

East access road fill continues.

Gp. C.O. advised 4 March that aggregate dryer could be removed.

Gp. S-3, Lt. Col. [Glenn J.] Allen, is on job in charge of demolishing pier 6.

7 March 1953, 0635 hrs.

Job progressing, but slowly with only two piers [ready for us] to work on placing concrete. Pumpcrete plant works fine. Curing cabin in raised position works out O.K., however no more will be built as weather is beginning to moderate.

Blasting, drilling, and breaking underway in pier 6 at depth of 6' down. Hole makes water at a slow seepage rate. Although some of the concrete 6' down is soft, there appears to be a reasonable grout mixed in with the aggregates.

Pier 1 excavation proceeding very difficult at elev. + 2' MSL. Large rocks do not enter bucket of clam.

Should place D pour, pier 8, today.

Beam fabrication continues with first diaphragming⁴³ begun yesterday. No bad shortage of cranes now. Aggregate bins and aggregate dryer removed yesterday and bins reset on near shore.

Jackhammer treatment given to downstream column pedestal of pier 7, C pour, where 4" "suck" occurred due to vibrating stiffener lost? Repair will be monolithic with D pour.

10 March 1953, 0650 hrs.

Gp. C.O. inspected job yesterday. Lt. **Col. Allen**, Gp. S-3, is in personal charge of demolishing pier 6. They are now about 16 ft. down.

Gp. C.O.'s verbal O.K. received to make and launch a continuous beam from W abutment to pier 7, as a means of gaining continuity for riveting, decking, and diaphragming crews. Will launch to pier 5 from W shore and remainder from near shore.

Pier 7, pour D, placed yesterday.

Excavation continues on pier 1. It **began** to make 300-400 GPM last night.

Diaphragming to be the same as in plans. Gp. and Bn. C.O. will not buy X-bracing that does not butt tight to 48" beams.

Job is hindered for [lack of] cutting torches and arc-welding machines, Gp. C.O. and Gp. S-4 advised. Panic button pressed.

11 March 1953, 0645 hrs.

Rained all night. Roads were soft yesterday with increasing number of frost boils. Far shore causeway very muddy. Pile **driving** hindered yesterday due to wet conditions and shut down last night.

Pier 1 making 500 GPM, which required moving over 2100 GPM pump and installing. Rock holding up a high pile was jackhammered out. Pump-packing collar was broken when packing was tightened.

Forms going in E pour, pier 8.

Job needs cutting torches and welding rigs badly.

12 March 1953, 0645 hrs.

Hard rain and sleet continued until noon yesterday. All equipment and materials were evacuated from both causeways. Sunshine in P.M. helped dry up a bit, but there is 2" of snow on ground this morning. No productive work except in carpenter shop and setting forms pier 8 yesterday.

Far shore causeway will require extensive fill. River level is higher than normal by four feet and very swift, eating off near shore causeway upstream and on end.

13 March 1953, 0645 hrs.

Temperature at this hour is 22° F. Rain, sleet, sunshine, snow, and hail intermittent all day yesterday. Began moving equip-

ment back on causeway far shore after removing some muck and filling with firmer material. Adding sand to roadway far shore.

Plan to place cap on pier 8 today. Carpenters setting forms for cap on pier 7. Pier 6 is excavated down below whaler and now close to bottom. Sump pump handled water until yesterday P.M.

Pier 1 excavation is hard and slow in hard-packed boulders. Excavation proceeding in sand in pier 2. Pile closure in #3 [was] expected last night as only two piles more were required. Plan to top down every 10th pile to hold against a washout if it comes.

River level from flood is not serious at this stage.

14 March 1953

Placed pour E, pier 8, last night. High tide of 25.9 [feet above mean sea level] at 1554 hrs. [at] Inch'on was at MSL 12.4 at 2005 hrs. on upstream edge of east causeway last night.⁴⁵

15 March 1953

High tide at Inch'on 0459 hrs. 27.5' equaled high tide at X-Ray 0915 hrs. 12.75' MSL. This tide partially floods near-shore causeway.

Lack of welders and cutting torches seriously delaying diaphragming and cutting of sub-decking.

16 March 1953

High tide at Inch'on, 0543 hrs., 29.5' equaled high tide at X-Ray 0950 hrs., 14.25' MSL. This tide floods most of causeway.

Gp. C.O. inspected hole, pier 6, early and, after inspection of bedrock and bottom, gave orders to fill with concrete.

Placing began at 1100 hrs. and was completed at midnight. All placing was "in the dry." Approximately 5 GPM were pumped periodically from downstream end until all leaks in pile joints had been covered. A mix 8:12:20 was used. Quality of concrete in pier is superior to requirements.

17 March 1953, 1710 hrs.

Fair weather for a change with temperature above freezing all day. High tide at 1030 hrs. rose to elev. 15.2 MSL. (Figure 66) Highest tide of spring expected tomorrow morning. Tide flooded both causeways and badly eroded near shore. Timing of tide hinders hauling in sand for concrete and repairs as tide covers sand bar.



Figure 66. Work continuing on piers 1, 2, and 3 from submerged east causeway during high tide on 17 March 1953.

Job badly needs welding machines for steel prefabricating and cutting torches.

Moving to near shore from far shore is order of the day. Pumpcrete and 34 E are over and volume buckets for aggregate bins are being set on near shore.

Pier 1 whaler going in tonight. E side of pier 1 piling caving in at bottom.

Pier 2 down and whaler in bottom nearly finished. Lots of sand boils in hole.

Piles on #3 reaching rock at very irregular levels. Driving proceeding nicely.

Excavation of E abutment progressed today. Shooting for elev. 49.08 downstream and

50.08 upstream. Will hold to these elevations for wing wall footer bottoms. Will take abutment proper to sound rock wherever located by drill test, probably about 49.0 + 6 inches. Cribbing for steel near shore out 300' now.

19 March 1953, 1430 hrs.

Drizzly rain all day.

Pier 1 burst water under third pile from NE corner on E side at noon. Hole was kept dry with two sump pumps prior to break. Water now making about 400 GPM. High tide was at 1153 hrs.

Pier 2 sanded in 2'-3' in downstream side last night. Moving both pumps to upstream side on middle whaler so we can excavate sand with clam and find and remove boulder holding up pile where sand flowed in.

Piles on pier 3 are on rock and exceedingly erratic in depth pattern. Still more driving to rock all around.

Job delayed for lack of cutting torches and welding machines. Will remove cabin on #8 Friday and on #7 on Saturday.

Mounted 50-cal. [machine guns] yesterday and day before,

eight on bridge and four in area. Constructing emplacements for same.

34 E pumpcrete bulkhead nearly finished. Batch plant rigged for operation on near shore.

20 March 1953, 1500 hrs.

Rained harder as the day wore on yesterday and by 1600 hrs. the clutch on P&H pile driver was unsafe to operate due to wetness of brake. Shut down rig.

Night crew reported for work as usual, [but] rain was heavier by 1900 hrs. About 2000 hours Lt. Scott⁴⁶ received permission from C.O. to shut down job as all cranes were unsafe and rain was still heavy.

About 2100 Col. Beggs called and asked about weather and river. River was then at a low stage, 11.0' MSL at 2200 hrs. Gp. C.O. ordered causeway evacuated. Evacuation was completed at 0145 hrs.

At 0730 hrs. this date, river was low. Bn. C.O. ordered equipment to resume normal operations. Operations normal by 0930 hrs

*At about 1055 hrs. I looked out the window of the Operations Shack and noted water had risen rapidly during the past 20 minutes. Walking out of the shack, past the abutment, and down to causeway, a matter of 5-6 minutes, the water was noticeably rising. Secured Bn. C.O. permission to pull equipment. Equipment was evacuated in 20 minutes and water was more than 24" deep in low points on near-shore causeway and flowing (washing) rapidly. (Figure 67) At 1210 water was at elev. 16.7' MSL as judged by eye from bluff looking at pile cut at elev. 18. Water has dropped about 4 inches as of this hour. Work continues on abutment, steel, batch plant, and drainage of area. Area is sea of mud.

22 March 1953; 1615 hrs.

River over causeway [on] near shore, ranging today from elev. 14.5 to 16.0. Cloudy and misty at this hour. Steel in E abutment and forms nearly ready [but] lack tie wire [for the steel] and bolting [to fix] wing walls [firmly in position], plus lots of clean up. Ditching main area road. Lowered both cabins 7 and 8 today. Roads very bad.



Figure 67. Storm water and a spring high tide combined to force an evacuation of the causeway on 20 March 1953. Piers 7 and 8 are in the foreground.

Figure 68. East abutment, completed on 25 March 1953, prior to stripping of forms.



360' of footbridge constructed yesterday for use when needed from pier 6 to far shore.

Started filling near-shore causeway with clay from top-side, this P.M. Drilling to blast rip rap on bluff south of bridge. Rip rap to be on causeway.

Marines closed roads and delayed work yesterday and day before.

25 March 1953

Rained again last night and road between bivouac area and X-Ray is impassable again.

Placed concrete in E abutment and wing walls last night, finishing at 0100 hrs. today. (Figure 68) Used navy cube⁴⁷ for water w/34 E paver discharging into 2 yd. bucket hoisted by 1½ yd. P&H.

Curing cabins on piers 7 and 8 are disassembled and H-beam bottom-frame remains to come out. (Figure 69)

Set H-beam cap support for platform to launch steel on pier 8 yesterday P.M. Riveting and diaphragming continues on a two-shift basis. Additional welding machines received past three days bring us to five on far-shore steel. More cutting torches received yesterday and when more oxygen gauges are received we will be in good shape on welding rigs but can profitably use more arc welders. Moved nine civilian welders from B Company to X-Ray yesterday to take advantage of new rigs.

Water level yesterday and today is at a mean of 12.5' MSL. Very little sand in sand bar available. Two ¾ yd. drag buckets pulling from upstream side of near-shore causeway and making money.

34 E platform disassembled yesterday and will be re-erected today. Mucking out began yesterday in #1 pier.

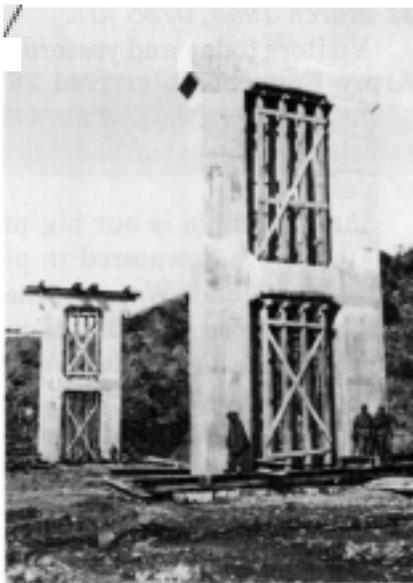


Figure 69. Completed piers 7 and 8 in late March 1953. The supports seen under the middle stiffener and the cap stayed in place at least 14 days.

27 March 1953, 0755 hrs.

Visitors today and yesterday. Lt. Col. [Willard D.] Arnold, 8th Army Engr. Sect., arrived 26 March, 1400 hrs., and departed about 2130 hrs. **Maj. Zwick**, 417th Eng[inee]r [Aviation] Brigade, is visiting to report on bedrock and possible scour action at bottom of piers.

Pump trouble is our big problem. Early on 25 March about 0800 we were dewatered in pier 1 and bedrock was showing in downstream end. Water broke under two piles near center of E wall and forced removal of men and equipment. All efforts to dewater since have failed. Water was brought to within two feet of bottom the afternoon of 25 March and sand removed in upstream end, but at least 12" of sand remains that washed in under the piles. This morning the 2100 GPM is not operational and the 1000 GPM is producing less than 300 GPM. We will shut down pump and again hammer all piles in an attempt to close entry of water.

Pumpcrete and 34 E platform are in place. Causeway is about elev. 16 to within 20 ft. of pier 3. Dragline (1½ yd.) excavating causeway on far shore.

27 March 1953

Col. Beggs visited job and after inspecting hole pier 1, observing water coming in near boulder in NE corner, ordered divers sent up by Gp. to arrive tonight. Plan is to muck out, one of us to inspect hole after mucking, and then pour concrete around edges and over boulder. Dewater, cut out center of bottom to bedrock, and fill with concrete.

Gp. C.O. approved curb form and rail posts to set on slab, slab to be screeded 25' width, corrugated deck to ride up 1" on top flange splice plates. Method of placing slab to be by pumpcrete spotted near center of bridge and place W side first. Will shoot for 242' a day with curb to follow next day.

Pumps moving to pier 2. Causeway is out to pier 3, and we are hauling clay for fill up to elev. 12.

29 March 1953, 1700 hrs.

Visited at 1300 hrs. today by Col. Rumaggi and Col. [Ellsworth B.] Downing, 8th Army Engr. and Ass't. Pleased with progress and plans for future operations.

Col. Beggs came up yesterday and is pushing divers and work



Figure 70. View of the footbridge that enabled the pumpcrete machine to pump concrete from its location near pier 3, at center, to pier 6 across the river channel.

on #1 and #2. Divers made good progress today removing sand and report 1' sand on upstream end [of pier 1] remaining.

Gp. C.O. urged pouring of B and C pours, pier 6, via footbridge. B pour forms being set now and scaffolding half completed. Weather is smiling on us for a change.

Causeway extended barely past #3.

Rigging going up on pier 7 for launching and Manitowoc on last legs.

1 April 1953, 1745 hrs.

Clear this morning and cloudy this afternoon. Placed cap around edges of pier 1 yesterday P.M. up to bottom whaler. Diver says concrete is covering bottom and soft this P.M. Maj. Carter dived in shallow water suit to inspect bottom before placing in pier 1. Found edges 18" from sides and 36" from ends clean to bedrock. Sand heaped in center area.

Divers excavating in pier 2.

Placing B pour, pier 6, now using footbridge to span river. (Figure 70)

Dragline between 6 and 7 has channel to sand bottom. Still

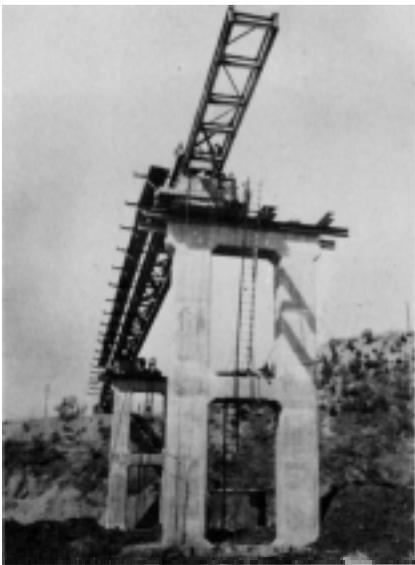


Figure 71. Downstream girder launched from the west abutment across pier 8 to pier 7 on 6 April 1953. The 30-foot launching nose extends beyond pier 7.

working, causeway is well past pier 3.

Second batch of 56 guard-rail posts pulled today and found well faced. New 1000 GPM pump delivered day before yesterday will help. No critical shortages, comparatively speaking.

Rigging for launching 7-W span progressing. Hope to launch next Monday, 6 April.

5 April 1953

Yesterday divers completed cleaning bottom of pier 2 and removed all loose rotten bedrock from surface. 4' cap placed with pumpcrete successfully. Will dewater at midnight tonight, drill 4' hole in bedrock, and then complete A pour.

Pier 6, C pour this morning using footbridge.

Pier 1 cap excavated and sand previously piled in center by divers removed. Will pour today remainder of A pour in #1.

Rigging for launching downstream girder (2 beams) on far shore being completed today.

Dry weather is helping us get back to motor park.⁴⁸

7 April 1953

Placed A pour, pier 1, on Sunday successfully and on 6 April placed pier 2, A pour.

Excavation near bottom on pier 3 and all piles down except NW corner and adjacent piles.

Began driving piling #4 last night.

Causeway barely past #4.

Launched downstream girder from W to 7 yesterday. No trouble; #8 moved 1" with greatest movement occurring just before nose hit #7. #7 moved $\frac{3}{8}$ " maximum. Both piers always came back into position. (*Figure 71*)

Col. Kelly visited job yesterday and was complimentary, **accompanied** by **Maj.** Eiler.⁴⁹ Weather warm and mornings foggy.

9 April 1953

Trouble in caisson #3. Last night as divers were measuring distance for cross members for bottom whaler, the ends measured **3'11"** and the center **3'9"**. Measurements made inside piles to inside piles from N end to S were as follows:

1 — 79"	3 — 56"	5 — 49"	7 — 47½"	9 — 64½"
2 — 58"	4 — 61"	6 — 50"	8 — 64½"	10 — 64½"

Previous reports had indicated the W wall was toed in. This was supported by [the] fact [that] piles were away from top whaler. Last night divers said at first E wall was in but on recheck W wall was determined in. Piles are split near bottom of W side between 4-5 piles from N end and between **15–16** piles from N end. On S end piles are split on W side of center pile. Divers are rechecking **measurements** this morning. Divers reconfirmed 3 split piles this morning. **Bn.** C.O. decision to pull W half of piles. We will backfill to middle whaler which is crushed and attempt to dewater and remove.

Divers report sheet piles in NW corner are touching which is explanation why 30 minutes of driving failed to lower corner pile which is one meter high above. rock. All other aspects of job are progressing.

13 April 1953

Weather is favorable but cold winds hurt. Job progressing and predicted schedule today is as follows:

Drive Pile:

#3 — 15 April
 #4 — 17 April
 #5 — 25 April

Excavate:

#3 — 21 April
 #4 — 23 April
 #5 — 1 May

Finish Concrete:

#1 — 28 April
 #2 — 29 April
 #3 - 9 M a y
 #4 — 11 May
 #5 — 19 May

Launch Steel:

E-2 — 20 May
E-4 — 1 June
E-5 — 10 June
W-6 — 20 May
W-5 — 15 June

Finish Deck:

E-5 — 20 June
 w - 5 — 27 June

Present status: **W-7** downstream girder jacked to within 1' of plates [that launching rollers rest on]. **W-7** upstream will be finished on 15 April and then launched. Seven sticks [of] long steel being fabricated on near shore. B Company 90% effective as of today.

Pier 1, C pour, today.

Pier 2, B pour, complete, and forms for C pour going in.

Pier 3 piles pulled **W** half and all reset except three this A.M.

Pier 4 piles average 4' off rock.

Causeway half way out to **#5**.

Footbridge moved upstream between 5 and 6 to offset rapid current.

Channels between 7-8 and 6-7 are in.

Roads in dry condition and motor pool now in use. Bear of equipment shop still soft and impassable.

Gen. Tansey, G-4 D/A,⁵⁰ to visit today. Everyone hitting the ball and making money.

East approach road fill going in when pans not used on causeway or sand haul.

16 April 1953

Job progressing. Scaffolding on pier 1 and 2 is up, and steel going in for D pour. (**Figure 72**) High tide is holding up E pour on **#6**.

Pfc. James E. O'Grady, **DS**⁵¹ to B Company from 74th Engr. Combat Bn., was drowned this morning at 0827 hrs. when a boat with Lt. **Badman**⁵² and five men capsized in the channel between **#6** and **#7**. Boat line to upstream cable gave way allowing boat to drift against a downstream cable and turn over. O'Grady dived in to help a Korean civilian welder that was caught in a rope. Swift current carried him downstream, and boat was 150 yds. approximately away from him when last seen above water. Grappling

unsuccessful at 1500 hrs. from utility boat.⁵³

Driving penetration to rock on #3 is slow. All piles to rock (no go) but another shift required to get penetration. Will launch far shore three beams Friday P.M. or Sat. depending on wind conditions.

21 April 1953, 0900 hrs.

Job progressing and the most difficulty is on caisson #3 and short 15 piles for #5.

Ordered 35 sheet piles on 9 April. Five of these arrived 20 April and were wrong type. Lowboys at ESP⁵⁴ yesterday were loaded out with non-critical materials, one pulled away from sheet piles. Schedule calls for finishing piles, #5, on 25 April. This will delay us.

Pier 3 has a split pile on W side, one pile from SE corner, making 300 GPM approximately. Have set in a whaler at 12' down, have prefabbed two other whalers under this one; next lower 2" overall less in dimension and bottom one 4" overall less in dimension. Will lower these by measured cable to desired elev. as excavation proceeds. Have installed second whaler in #4 and dewatering with sump pump. (*Figure 73*)

Footbridge from causeway, #5, to far shore in operation yesterday P.M.

Three-beam girder 7-W down one foot and jacking proceeding nicely. (*Figure 74*)

Poured E [pour] of #1 yesterday and will place E [pour] on #2 today.

Steel fabrication proceeding on near shore for three spans, 5-4, 4-3, 3-2.

Reinforcing steel prefabbing and carpenter shop deck and



Figure 72. Inside pier 2 during D pour showing the pumpcrete pipe at top and the base for the pneumatic vibrator, used to assure proper placement of cement, at right.



Figure 73. The 4,100-gallon-per-minute pump used to dewater cofferdam 4 so that the lower whaler could be installed.

curb forms being prefabbed two shifts basis.

23 April 1953, 1440 hrs.

Clear, windy, sunny day. Warm this P.M. Work going nice 1 y.

Deck and curb forms being prefabbed.

Reinforcing being prefabbed for deck.

Spans 5-4, 4-3, 3-2 are in process of riveting and diaphragming. Have finished 16 splices, four diaphragms X,⁵⁵ and five sets of stiffeners on near shore. Setting bearing plates on #1 and curing #1, #2, and #6.

#3, divers are cleaning bottom of hole.

#4 has three whalers in position and fourth is now being set below the lower one. 1000 GPM pump is keeping water down about 24' from top. More clam work required when next whaler is set in.

#5, piles are down to within 10 ft. of rock, going O.K.

Three-beam girder, far shore, jacked down to within 30".

Pumpcrete set-up going in on far shore. Approach roads W side [are] to grade most places. Base and finish course for approach roads to be crushed from local cliff basalt.

25 April 1953, 0925 hrs.

Gp. C.O. visited job yesterday and ordered a bulkhead put in #3 about 3' from downstream end to hold concrete up 15' to seal off split piles. Remainder of bottom to get a 3'-4' cap when clean. Divers finished cleaning bottom yesterday P.M. This A.M. status is five piles hooked together with 12" H-beams resting on bottom, three whalers preventing pile movement upstream when filled with concrete. Timber laps or panels will cover space between piles and edges of caisson.

#4, high pile in SE corner allowed [to] cave in yesterday P.M. and pile rig moved over from #5 and redriven. Excavation by clam this A.M. proceeding nicely. Steel on far shore 7-W is about 14" from cap.

Two 2100 GPM pumps arrived yesterday.

26 April 1953, 1500 hrs.

Placed concrete blanket in #3 this A.M. and [it is] up 20' on downstream side. Blowout in NE corner of #4 about 1500 hrs. Hole now has 3½'-4½' sand upstream end. Prior to blowout sand was 8" upstream and 20"-22" downstream. Tapped down pile, still in progress.

#5, second whaler going in now.

#4 has 4100 GPM of pumps making full pipe.

Weather fine. All other work continuing.

29 April 1953, 1800 hrs.

Just completed A pour on pier 3. Will pump down #4 after midnight, clean up blanket cap, and place A pour on #4 tomorrow.

Rain yesterday, last night and all today a slow rain. River not affected as yet. Watching closely. Night shift advised of precautionary measures to take in anticipation of possible high water.

#5, bottom (4th) whaler is hanging and clam is cleaning out. Pile on SW corner will not budge. Hole making about 2500 GPM with lots of aggregate coming under SW corner. Will muck out with divers.

Lack about two days riveting on near shore 3 spans, and one day more diaphragming on span 7-W. Deck going on downstream of 7-W.

Job on schedule to finish 27 June. A flood will hurt us bad.

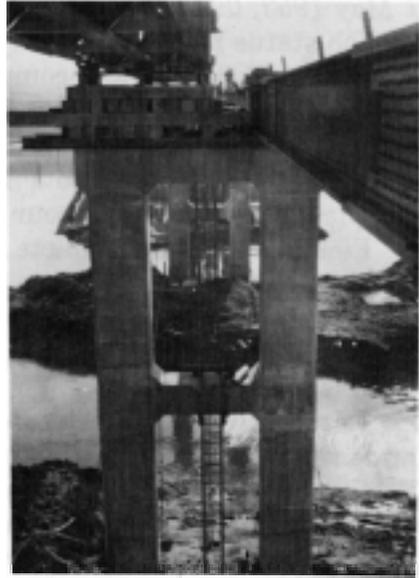


Figure 74. View showing cribbing used in launching upstream girder from the west abutment to pier 7.

1 May 1953, 0910 hrs. (Map 4)

Job status as of this hour:

Piers 1, 2, 6, 7, and 8 complete.

Pier 3, pour A complete, B pour forms and steel ready for concrete when A pour has set.

Pier 4, a blanket placed 3½' and another pour averaging 15' completed. Will finish A pour on 1 or 2 May.

Pier 5, expect to complete mucking and pour blanket 5'-6' thick this date.

Causeway complete.

Abutments complete, except E abutment requires step after steel is launched.

East and west approach roads, sub-grade complete except 400' on E where steel fabrication is accomplished.

Steel 7-W launched and nearly sub-decked.

Spans from 5-2 will be riveted on near shore today or tomorrow. Diaphragming underway.

3 May 1953, 1820 hrs.

Just finished A pour of pier 5. The last one. Oh Happy Day!

7 May 1953

Have completed C pour, pier 3 and 4, and B pour, pier 5. Three spans of steel on near shore nearly ready for launching on 12 May. Decking on upstream will be finished tomorrow and downstream to follow. [Launching] **Rollers** are in place on pier 1 and 2 and rigging going in now.

Deck on 7-W is ready for concrete at 0500 hrs. tomorrow. Army issued a lot of changes via telephone from Gp. C.O. last night but resolved today. Contrary to previous agreement we will pour monolithic from 7 to 8 to W abutment.

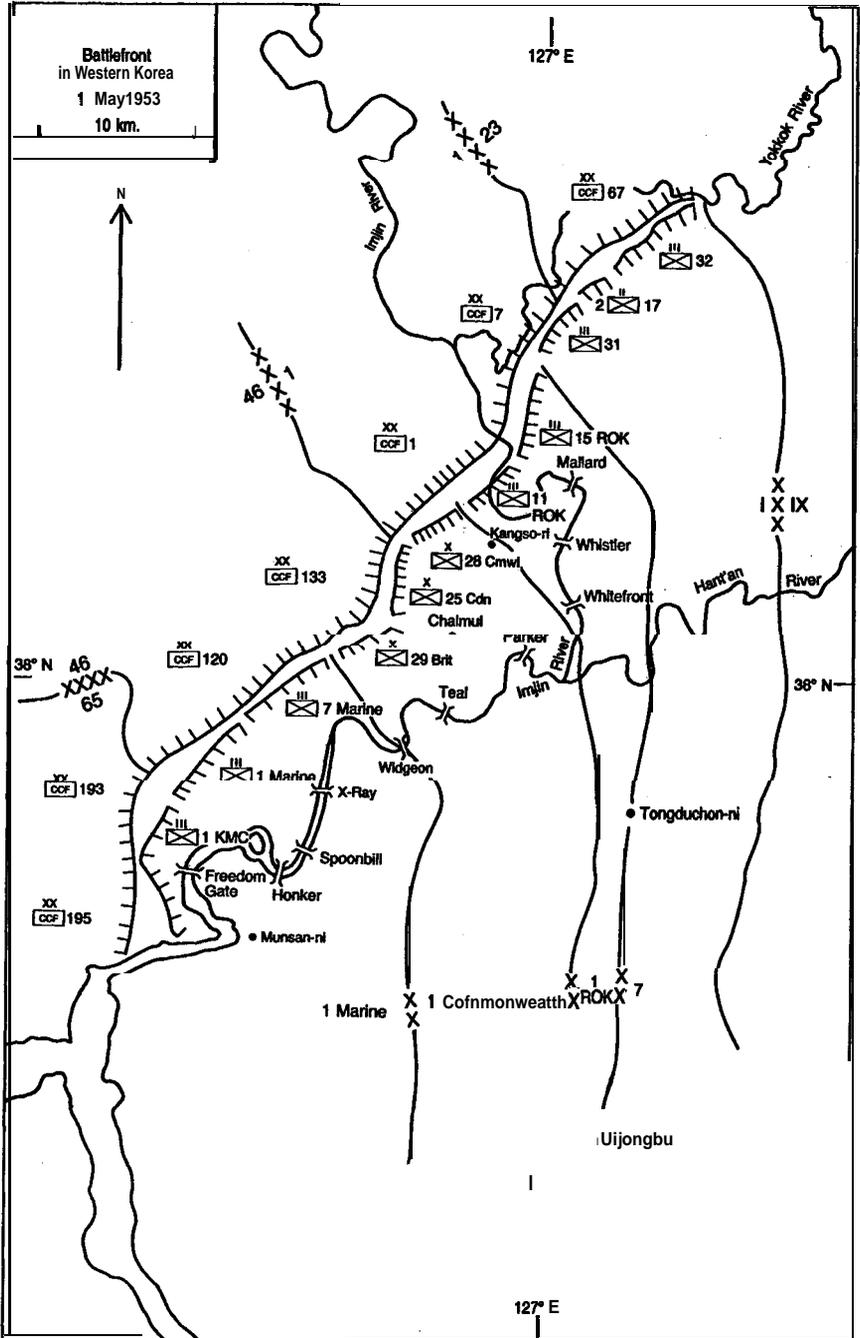
Forms ready on pier 3, D pour. Working tonight on D of 4 and C of 5.

Crusher broke gears last night for second time.

Pontoon bridge going in before Sunday will hinder operations of concrete work. Asked for 2MPs near shore to give us priority.

8 May 1953

Deck slab 7-W placed between 0720 hrs. and 1520 hrs. this date. Cracks occurred between 7-8 and 35-40 feet west of 8. Cracks are deep and occur more or less diagonally.



MAP 4



Figure 75. Troops laying the concrete deck. Two steel mats reinforced the concrete to provide an "antiartillery" safety factor beyond the necessary load-carrying strength. The concrete placing was monolithic and continuous.

Mix was 8:12:20. Concrete well vibrated and well placed, tamped, and screeded. Sun was hot after 1400 hrs. but not when cracks appeared at 1300 hrs. No cracks observed nearest abutment. My belief cracks were due to movement caused by reverse loading span 8-W with concrete. Wind was 15-25 MPH. Concrete is under sand bags and/or canvas and sand. Moist.

11 May 1953, 1630 hrs.

Rain, a drizzle yesterday and this morning heavier. This P.M. rain was hard until 1600 hrs. Bn. C.O. ordered evacuation of all equipment from causeway about 1300 hrs. Evacuation complete except final removal of footbridge.

Pier 5 ready for concrete D pour.

Pier 3 and 4 lack E pour forms which are on scaffold but not in place. Schedule calls for D of 5 today and E of 3 and 4 tomorrow.

Curb upstream placed this morning, and about $\frac{1}{3}$ of downstream, span 7-W. Rain prevents proper finishing.

12 May 1953, 1730 hrs.

Rains of two previous days hit us at 0915 hrs. when water began to go over causeway. All equipment removed. Men left working on forms, #3 and #4.

Finished placing curb this P.M. Spoonbill out and **X-Ray pontoon** out. Water now at 20.4 ft., highest this year.

Launched **3-beam** upstream girder to #1 today. Lots of trouble **due** to cribbing **sinking** from rains.

Unloading cement from railhead.

Reinforcing prefab and **corp [sic]** prefab tonight. Steel near and far shore will be welding.

I Corps C.G.⁵⁶ visited job this P.M.

14 May 1953, 0820 hrs.

River flood readings, MSL, follow:

<i>Date</i>	<i>Time</i>	<i>Elevation</i>	<i>Date</i>	<i>Time</i>	<i>Elevation</i>
12 May	1330	20.0'	13 May	1400	18.3'
12 May	1500	20.3'	13 May	1500	18.2'
12 May	1600	20.4'	13 May	1600	18.0'
-12 May	2100	20.4'	13 May	1730	17.9'
12 May	2200	20.0'	14 May	0700	14.1'
13 May	0700	19.0'	Causeway showing in spots.		
13 May	0800	19.4'	14 May	0800	16.8'
13 May	0900	19.6'	Tide coming in.		
13 May	1000	19.1'	14 May	0830	17.3'
13 May	1100	19.0'	HT at 0950.		
13 May	1200	18.7'			
13 May	1300	18.6'			

Causeway being extended **pan wide**⁵⁷ along rip rap upstream out to ramp. Men working on ramp for 34 E, badly eroded. New ramp near E abutment completed but water is too high to lay pipe. Believe quicker to repair old ramp between pier 2 and 3.

17 May 1953

Last pour of last pier completed at 2130 hours, 16 May 1953, on E pour, pier 5. D pour, pier 5, completed 0400 hrs., 15 May, and

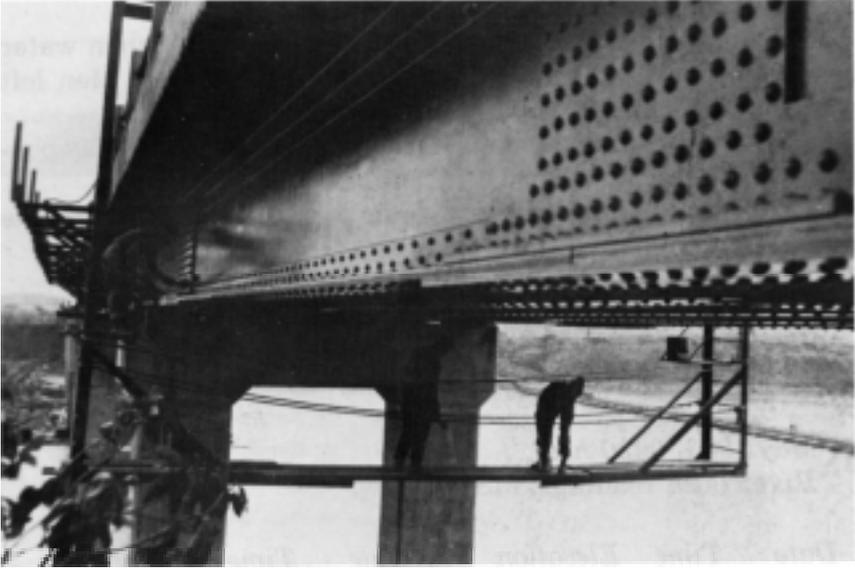


Figure 76. “Jackson’s chariot,” which could be rolled from the deck, providing scaffolding for bridge painters.

E pour of #4 and #3 during the daylight of 15 May. Only 15” of form removed from D pour of #5.

All steel is in place for final fabrication on both shores.

Carpenter shop is building more curb forms and deck slab forms. Also mess tables for H&S and C Companies.

Company C removing forms and building launching scaffolds.

Company A crushing road metal, prefabbing mats, cleaning and repairing pumpcrete, and policing job site. Have lots of hand dressing and rip rap to do on far shore approach.

1 platoon, C Company, at Whitefront fender pile job.

22 May 1953

Misty rain this morning.

Four arc welders are at Teal repairing bomb damage that occurred on A.M. 20 May.

Jackson ChariotSM transported to far shore yesterday and is now in process of erection to remove catwalks and [to] paint beams. (*Figure 76*)

Far shore steel requires two splices to complete riveting of span 7-5. Near shore requires 27 splices to complete 2-1-E.

Foundation for monument placed 21 May. Carpenter shop fabricating monument forms.

Far-shore batch plant removed and disassembled. **Road** metal crushed on two-shift basis. Should finish all reinforcing prefab tomorrow.

Job now out of **6¹/₄"** rivets for three days. Crews continued with other sizes. Ten cutting rigs received yesterday. A big help. Will return all unit **M/R** rigs now.⁵⁹

28 May 1953

About 1900 hrs. on 26 May three rounds exploded in the work area and to the north? The first was W of the material storage building and exploded about 3' below average ground level in the side of a ravine about 20 yds. from a quad **50** of 21st AA Bn., 25th Inf. Div.⁶¹ No one hurt

The **second** round exploded to the north of the main road beyond the fence some 150 yds. The third was not located but said to be near the cliff W of **#2** round.

Fuses and fragments were recovered from **#1** and **#2** rounds, and positive identification made at 25th Div. **Arty.**⁶² as Russian 76 mm. Fuses were **KTM-1** point-detonating type. Quad **50** chief reported an air burst at 0500 hrs. on 27 May upstream from bridge 200 yds. and on far shore. No verification.

Riveting will be complete today except last minute cut-outs? Welding of diaphragms nearly complete. Rigging of rollers on **#6** complete with roller on top of **#3** and **#4**. Decking still required on span **E-2**. Steel 5-7 practically complete. Stockpiling road metal on near shore. Approach roads up to steel fabrication sites complete, both shores.

Monument requires final top pour and walls. Setting wall foundation forms today. Cleaning piers down, and policing area. **Hauling** unused materials to **railhead** and **ESPs**. Weather is fine. Morale high.

3 June 1953, 0750 hrs.

Upstream girder **E-1-2-3-4-5** launched by 1545 hrs. yesterday. Downstream girder **E-1-2-3-4-5** launched by 0730 hrs. today. (*Figure 77*) Now jacking down, installing catwalk and readying for further superstructure work. Rain last evening and last night does not help.

On 2 June job was visited by **Col. Davis**,⁶⁴ **Col. Ribbs**, **Col. Downing**, and **Col. Beggs**.



Figure 77. View showing portions of the 606-foot girders that were launched from the east abutment to pier 5. These were the longest girders used on the bridge.

5 June 1953

Both upstream and downstream girders are jacked down. Seven diagonal diaphragms nearest #5 are in process of welding. Sub-deck complete except for loose areas over piers and diaphragms. Steel beams cut to proper length and in position. E abutment step forms going in. W approach slab being graded. Gp. ordered a 50' slab of 8" reinforced concrete on W approach with construction joint down centerline and expansion joint at 25'. E approach to be penetration asphalt.

Fill on E approach nearly to grade within 100 ft. of abutment.

Rock is on W approach.

Catwalk complete E to 5 up and downstream.

Slab forms nearly complete upstream.

Getting ready to launch 7-6-5.

9 June 1953

Job Status-Rain began about 0400 hrs., some 50 ft. before deck slab 5-4-3 was finished. Concrete completed to 3 and rough screeded, but left high near 3 expansion joint. We are reworking it

now. Began pour about 2100 hrs. last night. Bridge girders were surveyed-in the day (5 June), jacking was complete, and we lost one shift as a result of wrong elev. on center **screed** and edge forms.

Diaphragms **finished**. from 3-2 and welding continuing with **sub-deck coming** along behind them fine. Reinforcing going in at 3 toward 2.

Gin poles are rigged on 5 and 7 and will be ready to lift with more welding. Can begin jacking down **7-6-5** this P.M.

Army yesterday asked for bridge to be finished on 13th. 16th with no more rain will be difficult. A lot depends on 5-6-7.

11 June 1953, 0820 hrs.

Finished deck slab **0400** hrs. from **3-2-1-E**. Last night we removed curb form from **5-4-3** placed yesterday noon. Curb excellent. Now setting curb starting at 3 working toward **2-1-E**.

Upstream girder from 7-6-5 finally in position 10 June, 1600 hrs. Moved gin poles and moved beams into E-W position last night on downstream girder. Beginning jacking down now. Weather clear after 0900 hrs. yesterday and last night. No air raid last **night** for a change.

Will try to finish off approach road E today.

Gin poles and chain hoists worked fine.

12 June 1953

Raining-Rains come almost daily now, of the shower variety instead of heavy mist. Very heavy this P.M.

Steel from 5-6-7 down on bearing plates at 0500 hrs. yesterday. Diaphragming continues.

Placed curb **E-1-2-3** today.

Visited by two **B.G.s**, ROK Army AG and Engr., Gen. **Um**.⁶⁵

Removed pump and crane and all property from causeways.

Knocked **off** all crews tonight except carpentershop and **welding**.

15 June 1953

Deck slab from 7-6-5 placed, finishing at 0400 hrs. this date. Deck slab **from** 5-4, west 30' placed 13 June at night. Curb from 5-4, **30'** W placed night of 14 June.

Cleaning and policing job.

16 *June* 1953

Last concrete completed at 2345 hrs., 15 June, in curb span 5-6-7.

5 *July* 1953

The **X-Ray** project became the completed Libby Bridge yesterday at dedication ceremonies by Gen. Maxwell D. **Taylor**, Commanding General, 8th United States Army, attended by 35 stars and **dignitaries**. Good weather, good ceremony. Bridge opened to traffic, all except tanks, at 1200 hrs., 4 July. This log is hereby closed.