	Penn Avenue over TH 62	Xerxes Avenue over TH 62
Contract Start	Monday July 22, 2013	Monday, April 15, 2014
Contract Completion	Saturday,October 12th, 2013	Friday, June 27, 2014
Duration	83	74
Actual Start	7/23/2013	4/7/2014
Actual Finish	10/19/2013	6/27/2014
Duration	89	82

Mock Panels

First drawings transmitted 9-16-13, returned 9/19/13 for corrections

Second drawings transmitted 9-25-13, returned for corrections

Third drawings transmitted 10-1-13, returned 10-29-13

Forth drawings returned 11-18-13 no exceptions taken

Mock panels poured 1st week in January, cured 7 days, mock erection on 2-12-14, grouting on 2-12-2/14/13

Contractor thought the mock panels were worthwhile to test grout, forming methods and setting. Grout was predicted to have a burping effect where once the grout was filled through the shear pockets there would be a settlement upon curing. The grout selected, BASF Masterflow Fluid 100, appeared to have an expansive property and mounded up over the shear pockets during curing rather than settling.

Coring revealed there is very little tensile bond to underside of panel with grout. Three techniques for roughening were tried: no treatment but power washed finished underside (Cores 8 – 12), sandblast finished underside (Core 1, 4), roughened formliner (Core 7). Note they mentioned thinking about casting on 80 grit sandpaper also but did not do this. Grout did not stay on most of the cores in extraction and separated. Due to no noticeable difference on the roughened underside, sandblasting the underside over the girders was abandoned on all but six panel P-2 at the inside girder line. I did make calls to Utah and they are not in the practice of requiring a roughened underside for stool bond.

At the shear pockets, three treatments were performed: Duct tape over shrinkwrapped foam blocks, Styrofoam bocks only, roughened foam. The roughened foam was leaving embedded residue in the stripping, the stryofoam only was too smooth, and the taped blocks seemed a decent compromise that left a groove for roughness where the tape was. However, in the finished product I was disappointed because there were many embedded shrinkwrap pieces I had to point out to them to remove and the duct tape was not built up enough to provide the keyway grooves desired. Sandblasting was not permitted because of the epoxy-coated rebar penetrating the shear blockout. There was a lot of cleanup because of the rebar penetrating the shear blockouts.

Pictures of cores and mock-panel are located here: S:\Construction\PHOTOS\Metro Region (Districts Metro) Pix\Bridges\Under Construction\27504 Precast Deck\Mock Panel\

Precast mock panel erection occurred too late to change significant details. One of them was the leveling devices. The threadbar selected was coarse thread 1” diameter x 18” long coil rod. When the mock panels were set with four leveling rods each, any adjustment to the leveling rod shifted the panel a lot. The coarse thread made the bars difficult to turn for fine adjustment and they really had to wrench on it. In retrospect, the leveling rod bearing end should have been ground to a central point to keep it from walking. By the time the contractor realized the leveling rod issue all leveling rods had been stocked and production panels were just around the corner and needed to make schedule. The inserts for the leveling rods were onsite and were suited for the thread pitch in the coil rod. We were concerned about the grout. The grout

Drawings and Submittals:

A number of submittals were delayed during construction due to the division of work amongst the ironworker sub, the PT materials supplier, PT installer and PT grouter. Do not think in the future that this will not happen. VSL stated that more oftent the engineering services of their company are disregarded and the prime contractors are just ordering parts and delegating the installation to ironworkers. On this job that is what happened, and Lunda had to go back and hire VSL to give elongation calculations for the design. There were also several installation questions that would have been avoided if VSL was the installer.

Precast production panels

1st drawings submitted 12-4-13, 2nd 2-14-14, third 2-28-14, and final 3-11-14 no exceptions taken

Precast drawings were out of sync with post-tension drawings, and this caused the later revisions in the shop drawing process. No rebar conflict drawings at anchors were generated but it would have been beneficial in my mind. Because I was onsite during first panel rebar tieing I was able to direct placement of reinforcement to alleviate conflicts. If I had not been there anchorage steel would have been misplaced – we got one panel correct and then everyone understood. Would highly recommend the designer be available for this end panel & anchor zone tieing assistance.

County Concrete has granted permission to share the precasting shop drawings publicly (Ted Casey Email dated 3/11/14 4:00 PM)

Pocket formers for anchorage

Lunda had VSL V-slab 6-4 system with 2 stacked strand per duct. There was concern that you would not be able to push the strand through an embedded anchor at both ends with this stacked arrangement. VSL's Dan Dock says he has not run into issues, but the contractor was worried that without a detachable dead-end then they might have difficulty getting the strand to exit through the embedded end. They requested the panels be fabricated with a post-installed anchor head on one end. This made sense to us as well in the event a strand was broken. VSL claims a plastic bullet can be fitted to the strand and once two strands are in it should find the hole – Lunda didn't want to be trial for this hypothesis. No strand were pushed in the mock panel. So the panels on the south end of bridge were detailed to receive a post-installed anchor. This affected the rebar placement in the anchorage zone and two typical anchorage panels became four individual panels. I ordered County concrete in the shop drawing process to make the bearing surface of the post-installed anchor out of metal forms to provide even contact between the concrete and the anchor trumpet. Wodd forms might show too much surface discontinuity and uneven seal for grouting. Lunda made up the plates for County Concrete and the sides of these blockouts were made of plywood. The pockets came out looking good with the trumpet head even with the concrete. Again I was onsite to direct some anchor zone bar adjustments due to lack of scaled shop drawings.

Pocket formers for anchor heads were not detailed with a radius. We had the shop drawings modified to show 1" min radius at the anchor blockouts. Ideally the duct coupler blockouts would also incorporate some chamfer or radius but since they were precompressed we let it go. Such detail should be incorporated into the contract plans because these corners are where shrinkage cracks occur.

Sandblasting the shear keys around the panels was for the contractor but manageable. The overhead sandblasting of the girder stool areas was a safety concern. We did only the six P-2 panels in the stool areas over one beam line in one span as mentioned earlier.

Wet cure time. The panel specifications asked for 14-day wet cure but the HPC concrete addendum stated 7-day wet cure. As a compromise, County Concrete did a 14-day wet cure on 6 P-2 panels. These were the same panels that were sand-blasted over one girder line. They should be permanently marked on the underside but unfortunately I think they were marked on the edge of deck that received the surface finish. At any rate, these panels are in the north span of Xerxes on the east side of Xerxes in beam line 5 as numbered from west to east.

RFI's that were submitted should be handled in future plans.

RFI: Precast panel lifting inserts – galvanizing requirements unclear. We agreed to a zinc plated finish meeting the requirements of ASTM B633 Service Condition 4. This is still not equivalent to the hot dip galvanizing, but is a much better coating—it is plated with more zinc, and also has a chromate coating, which prevents the zinc plating from being damaged by the fresh concrete and gives the item a yellowish color. If you decide to have the inserts you have re-plated to the higher level, the vinyl that is on the "legs" will need to be removed, it seems to peel off rather easily.

RFI: Embed clear distance – 3" was required but these did have a limited number of devices available. (Should have been prefilled with a threadrod to prevent threads from getting damaged or fouled).

RFI: Mock panel rebar did not need to be epoxy-coated. Ddi require ducts. Only 2 ducts used – may not be illustrative enough to fabricator and precaster on the importance of duct alignment and the difficulties with getting the shrinkwrap installed.

Shipping and handling – the precaster was unaware that precast shipping and handling calcs were required. I think this is important to clarify as required in the specs. I referenced PCI wall handling calculations. Shipping should be emphasized for dynamic forces also.

Leveling device layout

It would be a good idea for the contractor to lay these out as part of a contract submittal. It was not defined as part of either the erection plan or the precast shop drawings and could have been disastrous to the erection time.

The contractor did not have a complete plan for prelocating leveling devices. Gennadiy Begelman had laid out the leveling rods to avoid channels according to shop drawings but this was all on paper. I ended up providing a CAD-drawn pdf of where all the leveling devices would fall on the steel if laid out according to the approved shop drawings. This was crucial to the contractor and they identified 42 interfering channel connectors prior to the critical erection window closure – the plans had just shown them to be cut so that the horizontal leg only remained. These conflicting channel shear connectors needed to be removed and ground flush.

Demolition

Demolition went relatively well – during the weekend closure a beam section damaged by high load impact was replaced as part of the contract. When onsite Saturday afternoon during the girder section replacement, it was noticed that the new and larger web splice plates overlapped new finish coat paint and old primer. This was not foreseen in the contract plans and due to the limited time the contractor had to set steel, drill new hoels and make up the splice. Based on an examination of the performance levels in the bolted splice it was determined that a class B slip coefficient was not needed. If the class B paint would have been required, significant burden would have been placed on the contractor during that weekend window.

Specs failed to identify lead primer on the top flanges. This was an issue because the contractor had to remove all the channels during the weekend closure and the flame-cutting of channels painted with lead needed lung protection.

Removing channel connectors (Or studs) fully – There were 42 locations (See **Leveling device layout**) that needed to be ground flush to avoid conflicts with the leveling rods. Project staff said there should be a pay item for these instances.

Surveys

Bridge alignment was established by working points. Working points were shot onto the steel and found to be rotated slightly in plan geometry. Unfortunately the error was slight enough that 6 panels were set already when a meander in the overhang dimension was noticed. For future decks there should be geometry based in part on erected steel and abutments. Once the plan error was noticed a stringline was used and the deck geometry gradually brought back into alignment.

Stool shots

Precast panels are very different than setting forms. The deck thickness is cast and it may vary. In addition, the bottom needs to be formed in order to seal for transverse grouting. You can either set the bottom of deck uniform or the top of deck uniform. Leveling rods are not right at the joints so there is some art in getting the joints to align vertically. Lunda chose to set the leveling rods based on a measurement from the bottom of rod to the bottom of panel. This should have resulted in the bottom of the deck being fairly uniform, which it is. However, the top did encounter some variability which required grinding and loss of cover. The concrete top cover on the precast panels was 2 3/8" min cover prior to planing and the concrete deck was supposed to be 9" min after planing. After discussions with Lunda on assuming a ¼" grind, the precast drawings used a 9 ¼" deck thickness with 2 5/8" top clear cover (Although this was above plan requirement it gave a cushion at the joints).

The deflections in the plan were checked assuming the 9.25" panel thickness at time of set and 9" after composite. Typical construction elevation runs had to be modified to give a "stool" to top of deck because the deck was already ready to place rather than to the bottom of deck form. This perhaps was not thought of earlier in design.

Panel Erection

Lundas complaint was that the panel erection sequence required a large crane to pick panels to reach the sections in the plan sequence. The panel erection sequence demanded that full width panels be erected and progressed symmetrically about the pier for this two-span bridge. Lunda was hoping to change it to erect along four girder lines and then finish the adjacent four girder lines, but due to the diaphragms and potential for unbalance and panel shifting this was denied.

It was found out that the embedded lifting hooks were not cleaned out prior to shipping. The lifting embeds were in some cases partially filled with concrete and the contractor tride to clear the concrete mud from the inserts with a screwdriver and compressed air. After 20 minutes of trying to clear the insert the contractor thought the embeds must be shallower that presumed. They called the lifting hook manufacturer who confirmed that the lifting eyebar needed to be seated flush against the concrete prior to lifting. So the contractor thought that the lifting threadrod was too long and started cutting bars while at the same time trying to clean out the embedded inserts. Finally the threadbar was torqued into the lifting hook insert and the hooks were fastened to the crane. About 6' off the truck bed one of the lifting rods slipped out from the insert – it had not engaged the full thread of the insert. The other three lifting locations held and the panel did not crack to our observations. The panel was set down an the threaded rod was replaced with one more fully engaged in the insert. At that point laborers set to work on inspecting and cleaning fouled lifting devices while also attempting to preset the leveling device rods to the proper stool.

The order of panel placement was not discussed in advance of the placement weekend. The north end was where the contractor intended to push strands from and thus the embedded end should be located there, and then a post-installed anchor at the south end (Leaving the trumpet end open until strands are pushed). Leveling rod locations were provided by me based on taking the precaster's plan panel arrangement and rotating it 180-degrees to place the post-installed anchor locaiton at the south. This leveling rod arrangement was what the field sued for recording stool shots. Unfortunately the contractor had not realized this when he numbered panels for erection and delivery. He had based the erection sequence on an unrotated plan view which was out of sync with the transmitted leveling rod arrangement. The third panel was being set when this error was noticed. The error cost about 40 minute of resetting panels because of the need to adjust the leveling devices to the 180-degree rotated panel. Because the leveling rod layout was not used for numbering panel election sequence, all the correct span stool adjustments were hand-written on a field erection plan with panel marks that was rotated 180-degrees. This was conveyed to the leveling rod adjusters but did generate unnecessary confusion.

Plans did not give tolerance for erected panels. We ended up stating +/-¼" at the edge of deck and at transverse keyways. These tolerances need to be established prior to letting and the potential conflicts with shear connectors addressed.

Contractor was onsite at 3 AM setting up crane. First panel arrived 5:30 AM – lifting devices “too long” need to be cut. Notified that the working point geometry is 3” off of steel centerlines. Directed staff to use beam alignment and tie into abutments. Use CL beam as the control.

First panel in the air at 7 AM, set at 7:15 AM, second panel being set at 8:00 AM. Notice that Panel P2-7 is set on the west – stools and leveling device layout assumes it is on the east. Levlign device conflicts already resolved so the panels need to be reversed. 8:15 AM set P4-18

8:55 AM set P2-6

9:25 AM Panel 3 (P2-6) released

9:50 AM Fourth panel released

Panel 5 – difficulty lifting – upon initial lifting one of four lifting devices gave way just off the truck bed. Needed to clean concrete out of the lifting device inserts to engage more threads. Contractor was asking me how much thread do we need? I said they would have to ask the manufacturer but I know if it is a structural bolt roughly 1 bolt diameter of thread engagement.

Completed erection around 10 PM due to the plan survey adjustments.

Lunda thought a night placement would be very difficult and a weekend closure was the only way to go. The big crane takes 2 hours to set up, one hour to take down. You would need 2 big cranes at the intersections to do it faster btu the balanced erection need might compete with production. Lunda thought the road closure on TH 62 worked welll for staging trucks and getting panels prepped for crane hoisting.

A curved or skewed bridge would be near impossible in Lunda’s mind. Lunda bid in 2 surveys but for skew or curved much more would be required. To do more complex geometry you would need a clear plan for reference lines along edge of deck. The first panel would have to be nailed down exactly.

Duct alignment was not exact and varied from panel to panel. Even though county concrete claims the ducts were positioned correctly it is clear there is some misalignment between panels that is not uniform. The first strand had 2 to 3 couplings hit, overall about 20% of ducts had misalignment.

The round ducts helped with the shrinkwrap a lot. The shrinkwrap needed to be installed on before the panel was set and when pushed strand hit these misaligned ducts the shrinkwrap would be damaged requiring repair. Lunda foreman came up with a 2x4 shims to pressure the ducts into alignment so the cables could be pushed without too much damage to shrinkwrap. A heat deflector was used with an upside down torch. The heat gun did not give off enough heat to shrink the wrap.

Wire ties were used in the shrinkwrap because what was provided did not shrink down to a tight fit. A single coated wire tie per side of shrink wrap. These held the grout well and nogrout leakage or blockage was encountered during PT grouting. The intermediate vent grout tube was useful. (This should be required in future plan sets at mid-run because the subcontractor is claiming it is extra).

Forming transverse keyways and Transverse grouting

3 nights estimated under night closure for transverse forming.

Lunda’s engineer did not feel comfortable with the foam backer rod and silicone sealing of transverse keyways. They oped for playwood forming under the gaps whish required utilization of night closures on April 30 and May 1st. The formboards were suspended with heavy duty vinyl formties which were permitted to be cut at top of grouted keyway. Lunda in reviewing the project stated they would not have changed this due to the grouting leakage increases they thought would have occurred. As it was, a BMW was damaged during the transverse pouring.

It was recommended that next time the plans should clearly let the contractor know that transverse grouting may be done independent of the PT pushing.

RFI: Grouting test requirements. The spec was generic and difficult to clearly discern what testing would be required. In the end I ended up interpreting the specs in this manner:

Non-shrink grouting for transverse joints, haunches and shear pockets:

- Test ASTM C 230/C 1437 for each day per SB – 11.1.B.9.2
- (12) 2" cubes per day (3 at beginning, 3 mid-way, 2 sets of 3 for last transverse joint)
  - Make 2" molds (Brass molds) and test per ASTM C 942. See attached for 2005 ASTM specs – C31 talks about practice making molds. I am having the 2013 specs faxed over and then I will transmit those when I get them including ASTM C109.
  - 1 set of molds from the last set of molds and 1 set from the middle transverse set should be broke for strength at 20 hours after completing last transverse pour. If the breaks for the last joint do not come out favorable, a wait time between 6 and 8 hours will be established for the second set of breaks.
  - When the grout strength breaks meet 3000 psi start stressing within 3 hours of receiving positive break information. Stress a minimum of 5 ducts per side of bridge to get some compression in the panels (~225 psi). 5 ducts should be stressed as per the sequence on the stressing sheet.
- If it's the end of day, the rest of the PT can be delayed after 5 ducts are tensioned per side of bridge.

Mold set #2 broke at 9:40 AM

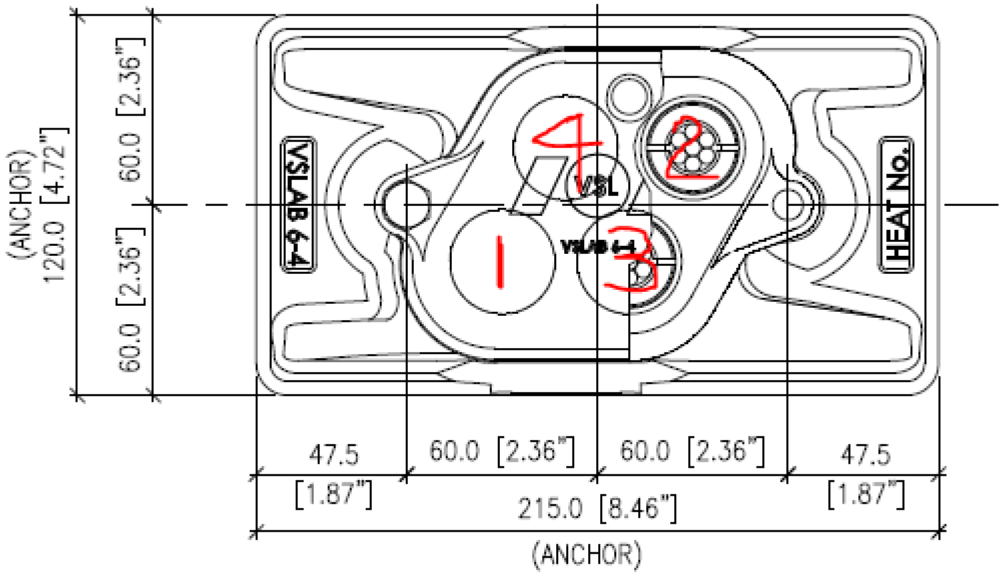
3,390 psi
3,710 psi
3,300 psi

Mold set # 3 broke at 9:45 AM having been made at
3,290 psi
3,110 psi
3,510 psi

Stressing sequence

Stressing requirements should be more prescriptive in the contract plans. They should be starting in the middle of each panel and working to stress toward the edges in order to better distribute the forces. Working from one side to the other runs the risk of misalignment of the panels and an unrecoverable geometry shift. The PT stressing plan was thoroughly reviewed and ended up being nearly prescribed. Here is an excerpt from the final email correspondence:

"Using your numbering, you should start in the middle of each panel and work toward the outside. In the east panel, the following sequence is acceptable – Start at E9 then proceed as follows:
E7,E11,E4,E14,E1,E17,E8,E10,E6,E2,E12,E16,E5,E3,E13,E15
Repeat simultaneously with west panel in the same sequence.
Show a sketch where the measurement reference location will be.
Show how the individual strands will be numbered within each anchor – they are stacked strands and I want everyone to be on the same page. I assume the numbering for tensioning sequence the first tendon would be as follows:
Assuming you are at tendon E9: E9-1, E9-2, E9-3, E9-4. The sequence of strand tensioning is also for even distribution of anchor forces:



END VIEW

Review the VSL Stressing notes from the approved shop drawings for specific sequence and stressing procedure. Important to not cut any strand tails until after elongations are reviewed and accepted by the Engineer.

Modify the PT Stress Record to list all the requirements of 67-SB and 68-SB (i.e., date strand installed, size and type; elongations theoretical and actual, anchor set theoretical and actual). Prepopulate this form to the best extent possible and resubmit.

Additional submittal or contractor information needs:

1. Strand test data and certs per 64-SB
2. Will a corrosion inhibitor be used (Strand installed and not grouted for period longer than 10 days).
3. Where will strand be stored onsite and how will it be protected from the elements.
4. Stressing jack calibration – certified calibration calcs and chart per 65-SB (Master gauge calibration onsite as necessary per 66-SB)
5. Elongations should be recorded to the nearest mm per 67-SB. For practical purposes this means to the nearest 1/16" of an inch, but a metric measurement is easier to work with for percentages and this is suggested as the preferred measurement unit.
6. Grouting plan, procedure and grout logs. This is supposed to be submitted 6 weeks in advance of grouting per 68-SB. Review all items in 68-SB. I need the training certifications of your grouting crew and the grouting foreman- the specifications are unclear but we expect the certifications should comply with national post-tensioning grouting certification programs such as offered from the PTI.
7. Contingency plan for leaking ducts per top of 69-SB.

We ended up agreeing after three revisions on a stressing form (See below).

SOWLES STEEL ERECTORS
MINNEAPOLIS • PORTLAND • BILLINGS

Stress Record

Strand Reel #:			Date Strand Installed:
Cross-sectional Strand Area (theoretical):	0.217 in^2	0.217 in^2	Date of Grouting:
Cross-sectional Strand Area (actual):	0.219 in^2	0.221 in^2	Stressing Mode: **One End**
Modulus of Elasticity (theoretical):	28,500 ksi	28,500 ksi	
Modulus of Elasticity (actual):	28,400 ksi	28,800 ksi	

Jack No. (circle):	6MR058	6MR046
Gauge No. (circle):	A	B
Ram No. (circle):	6MR058	6MR046
Pump No. (circle):	OTC657	OTC646

Technician:
Job Name / #: **S.P. 2664-16 (Xerxes)**
Contractor: **Lunda Construction**
Witnesses:
Weather:
Concrete Strength Req'd:
Concrete Strength Measured:

Required Jacking Force: **41 kips**
Anchor Set: **0.25 inches**
Elongation: **11.39 inches** **11.14 inches (after anchor set)**
80% Elongation: **9.11 inches** **8.91 inches (after anchor set)**
Tolerance (+/- 7%): **8.29 inches to 9.53 inches**

Area of Ram:
Gauge Pressure (20%): **1050 psi**
Gauge Pressure (100%): **5350 psi**

a	b	c	d	e	f	g	h	i
Strand No.	**Date of Stress**	**Jacking Pressure @ 20% (psi)**	**Measured Elong. End 1 @ 20% (closest 1/16 in.)**	**Jacking Pressure @ 100% (psi)**	**Measured Elong. End 1 @ 100% (closest 1/16 in.)**	**Measured 80% Elongation (column "f" - "d")**	**Average Strand Elongation in Tendon**	**% Deviation**
W1-1		1050		5350				
W1-2		1050		5350				
W1-3		1050		5350				
W1-4		1050		5350				
W2-1		1050		5350				
W2-2		1050		5350				
W2-3		1050		5350				
W2-4		1050		5350				
W3-1		1050		5350				

Specs should be clarified to indicate that for stressing, rams should have two gages shipped to site and each should have a calibration chart which is supplied to the engineer. Per Dan Dock, VSL: The jobsite should have four calibration charts, one for each of the gauges shipped with the ram. The ram serial number and gauge number is noted in the top section of each report.

PT System and Grouting

The PT system spec was, in a word, horrible. The strand system should be separate, the duct system separate, the anchorage system separate, and the grout system separate. The grouting was intermixed with the PT strand and ducts in the spec and it blurred the lines when different subcontractors were involved. The grouting should be totally separated with clear testing frequency and test requirements. On this job we ended up with the following by agreement:

Grouting for PT ducts:

- Fluidity tests in accordance with SB 12.3.F 4. and 5. (page SB 72 & SB 73)
- 1 wick bleed test per day per SB 12.3.F.4
- 2 daily wet density test per page SB 60
- (6) 2" cubes per day (Tested in groups of 3)
- Admixture test is using, ASTM C1090

Prior to PT duct grouting, an air test was to be performed on the ducts and anchorages. In the field the post-installed anchorages were not holding the air pressure after tensioning strand. Lunda could not get the trumpet to seal against the post-installed anchor head. They were supposed to use an epoxy bonding agent and put the anchor head on, and I am not sure if this was done – perhaps they did not want to risk having to remove the anchor head if the seal did not hold. Between the anchor head and the HDPE anchor cap there was a gasket. The gaskets provided by VSL did not seal the grout cap very well and apparently the embedded anchor ends would not receive the gasket very well. Lunda proposed to cast the post-installed anchors into a pourback using a Sika 32 bonding agent and BASF Masterflow 928 precision grout. We received confirmation from the chip seal manufacturer Polycarb that their product would stick to this material. We allowed Lunda to encase the ends prior to duct grouting leaving the vent tube exiting to the HDPE duct. Lunda poured the completed the north end anchor pourbacks at 4 PM, south anchor pourbacks at 7 PM on May 21, 2014. They were 12 and 15 hours breaks. Looks like the breaks significantly improve during the later hours.

North: 2,040, 1,810, 2,070 psi
South: 710, 560, 640 psi
2 sets of 3 left to break when directed

Per Tony Schrempp, they broke the south again at 16 hours and it was somewhere around 2700 psi. There is one set of molds left which we can break for an ultimate strength.

and Lunda ended up providing 1 PTI certified grouting supervisor. The specs did not require but we felt necessary to ensure good grouting.

1. VSL Deadhead Local anchorage for post tensioning. I believe this is the last outstanding item related to the production panel shop drawings. VSL needs to comment on the block out detail and send supporting calculations for their post tensions with anchorage provided in the panels.
2. Grouting Submittal in accordance with SB 12.3 - E
3. Erection Plan Submittal in accordance with SB 11.2 – 2
4. Post Tensioning, we have not seen tensioning sequence, elongation calcs and stresses as discussed in SB 12.1 – A

Beam stool grouting

May 14th Beam stool grouting with Fluid100 - 20 vehicles were damaged as a result of stool grouting. Usually with CIPdecks there is maybe 1 car. Shear pockets do not give adequate room to inspect for voids or to perform weld inspection and preparation. Highly recommend closure of traffic below during stool grouting.

May 29th: End pours and longitudinal forming and closure pours:

Wet cure though June 5th. Chip seal was placed on June 23rd.

General notes by contractor:

Did not think the precast deck offered any time savings. Forming the deck takes 1 night in each direction and then work can continue without impacts below. This precast deck took many interruptions to deck below. The interruptions were primarily caused by the sequence necessary to perform post-tensioning. In this job the end pours and longitudinal pours still required forming and a 7-day wet cure so very little schedule gain was achieved. There were also a lot of tests necessitated by independent testing agencies which will be accounted for in future jobs. In general, concrete beam forming of precast was perceived to be easier. Without the prestressing the precast deck would have much shorter durations than just experienced.

Would Lunda cast their own? The precast deck takes a lot of storage space. A plant or a contractor needs to factor that in.

Chip seal advantage in time is that striping can be placed in 14 days.

Additional comments

I am noticing no leaching which is very common on CIP bridge decks. The underside shows a single line of longitudinal cracks mid-way on panel. Once cause may be setting the panel on the outside leveling rods and bringing the interior rods to bear. It is also very likely they cracked during transport due to the truck bounce. The stool pour was showing voids near the panel ends. These were brought to the attention of the project staff and will be grouted. It seems this happened because the distance between shear pockets in adjacent panels is longer than shear pockets in the same panel.

Attachments:

Schedule with project staff notes.