CONSTRUCTION OF THE HOOVER DAM BYPASS BRIDGE

Updated 29 May 2009

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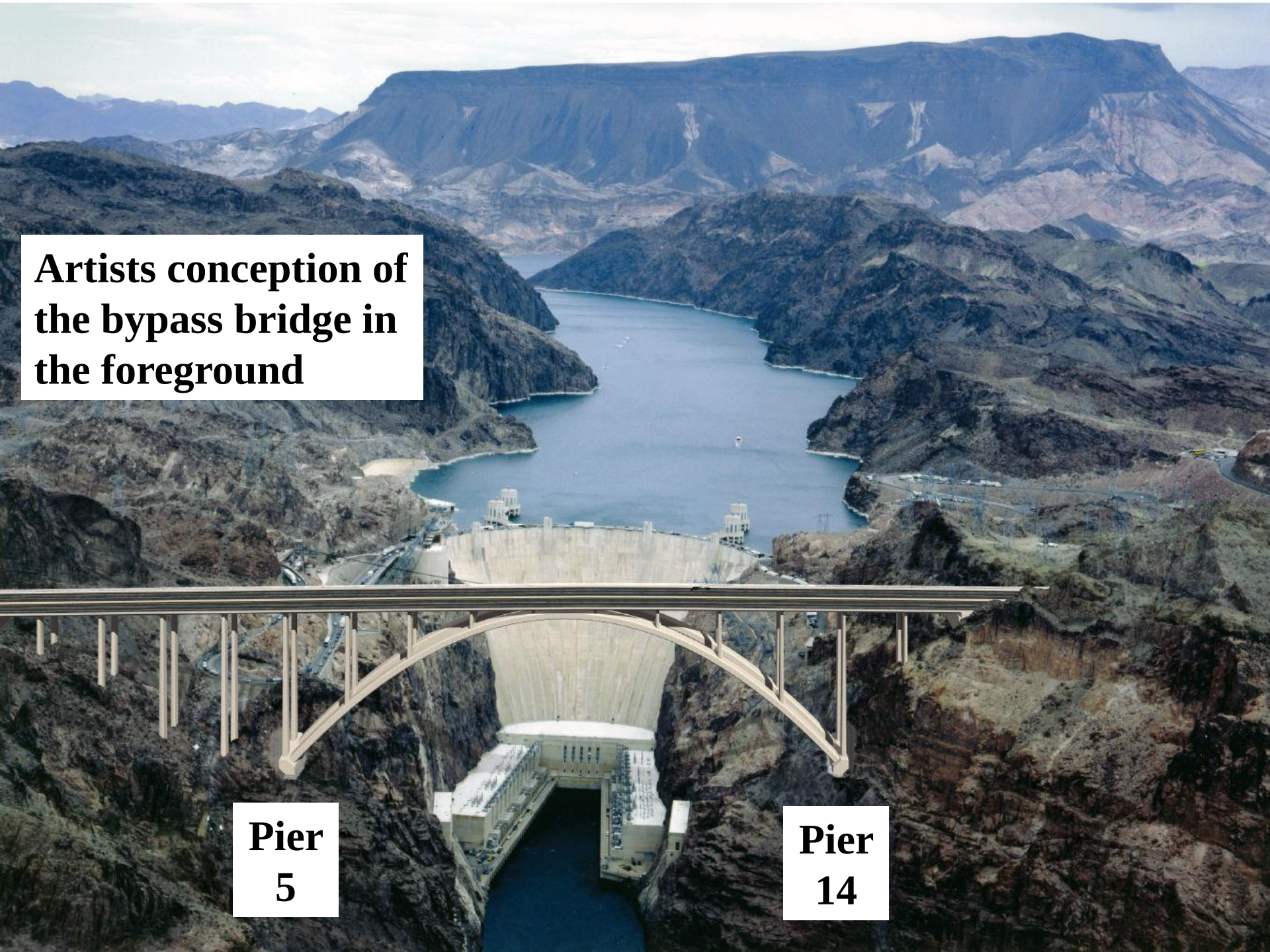
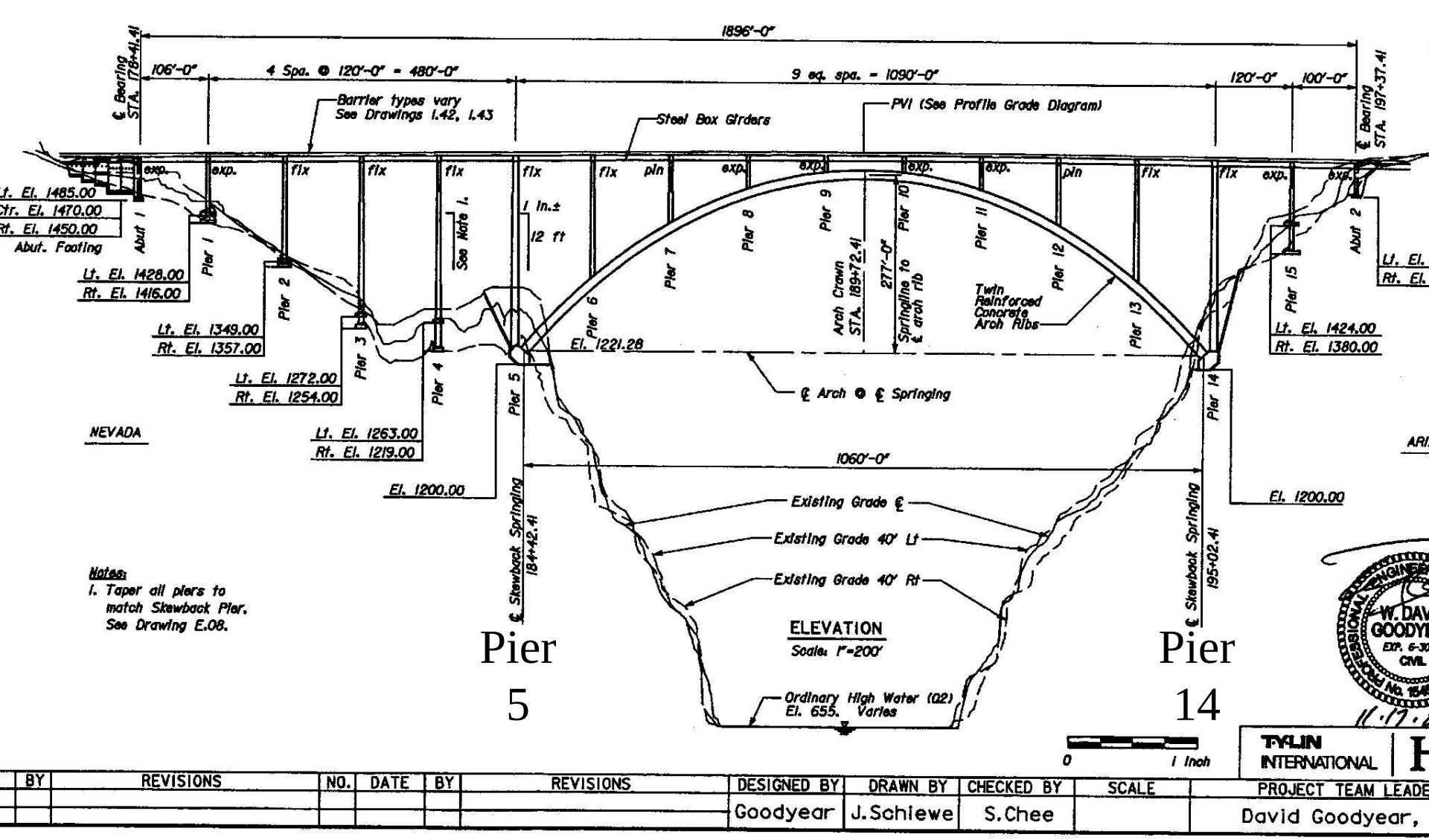
1,600 FT. SOUTH OF THE DAM
900 FT. ABOVE WATER
2000 FT. LONG
COMPLETION DATE: November 2010


Artists conception of the bypass bridge in the foreground
Pier 5
Pier 14



Pier 5

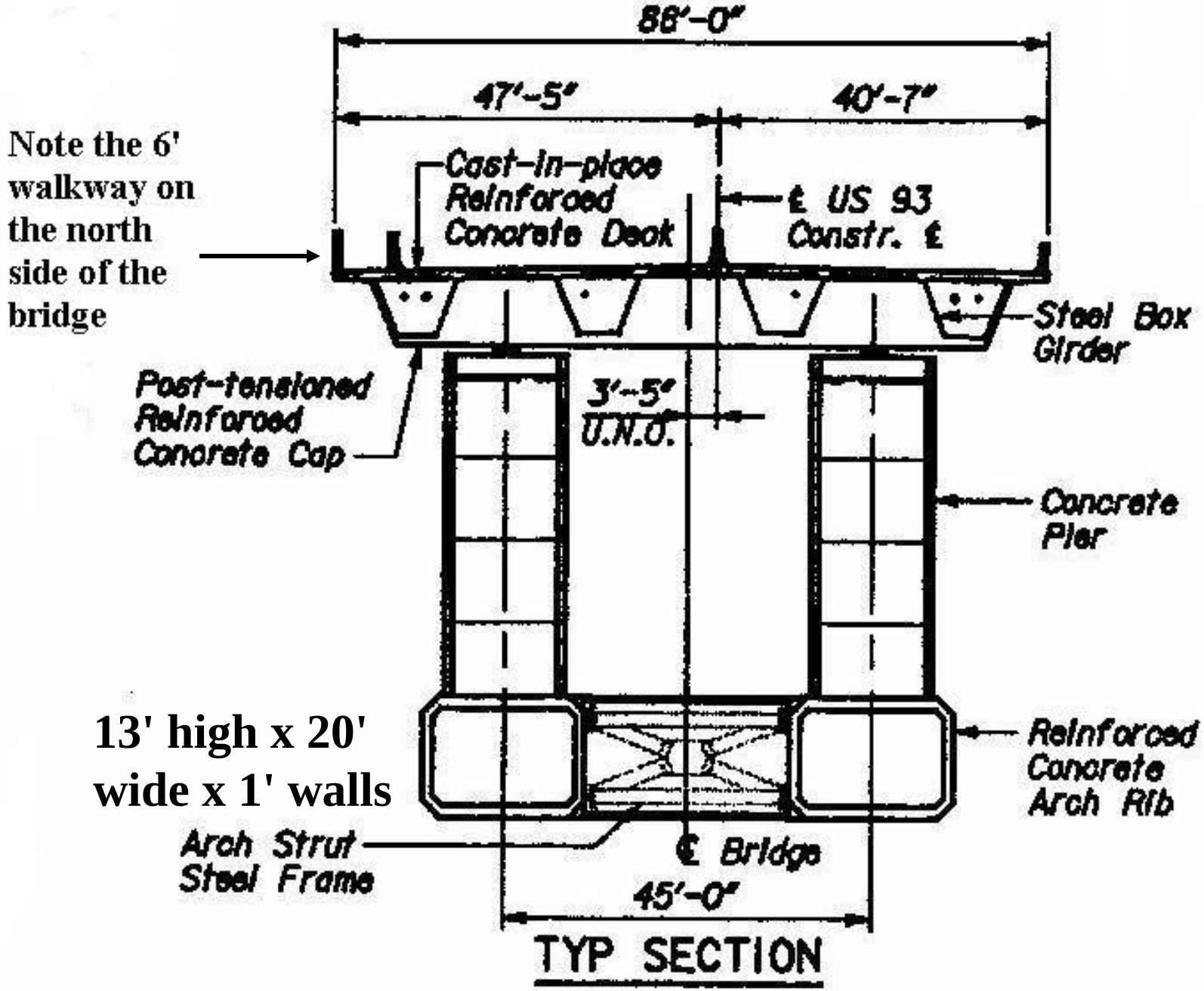
Pier 14

BY	REVISIONS	NO.	DATE	BY	REVISIONS	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	PROJECT TEAM LEADE
						Goodyear	J.Schiewe	S.Chee		David Goodyear,

BRIDGE DETAILS

LOOKING NORTH

US 93 SUPERELEVATION DIAGRAM



Note the 6' walkway on the north side of the bridge

13' high x 20' wide x 1' walls

The erection of the twin cableways was completed last year (2008). This made it possible to finish setting the beams from each abutment, pouring the decks out to piers 5 and 14 and completing the construction of the temporary towers. Now the thrust is to complete construction of the twin arches.

CONSTRUCTION OF THE TWIN ARCHES

The twin arches will be poured in 21' - 25' segments utilizing the green traveling forms. Five segments were poured before forestay lines were attached for support. Once the sixth arch segments were poured, forestay lines were connected between them and the top of the temporary towers. At the same time backstay lines were connected from the top of the temporary towers back down across each abutment to deadmen.

This will be repeated for every other newly poured arch segments. Simultaneous tightening up the forestay lines and backstay lines with the correct tension will keep the temporary support towers approximately plumb. The temporary support towers are supported on bearings so the lean is not critical. The forestay and backstay lines will be tightened up utilizing strand jacks.

The jacks for the forestay lines will probably be located at the top of the temporary towers, while the jacks for the backstay lines will probably be at the deadmen. See slide numbers 12, 13 & 14 for information on strand jacks.

The jacks will be sized for the maximum tension in the forestay or backstay lines. The appropriate number of strands will be used in each jack to develop the safe working load required.

Slide No. 11 graphically shows the temporary towers on piers 5 and 14 with backstay and forestay lines attached.

The green forms are traveling forms, not slip forms, ie, the forms are expanded/contracted as required after each arch segment is poured and the green forms are traveled up the already poured arch segments, reset and the next arch segment poured, etc. Each concrete arch cross section is 20' wide x 13' high with 1' walls.

That is why the outer section of the green traveling forms must be expanded and the inter section must be contracted. There is no adjustment for the camber or sideways alignment of the arches after they have been poured.

As the green traveling forms are being set for each segment of arch to be poured, adjustments to the curvature, side alignment, etc, must be made at that time.

If the arches sag a little after that segment has been poured and cured, then the curvature must again be adjusted when the forms are set the next time. The arches will not have a smooth radial curvature from bottom to top, but will be a series of short straight cord lines.

Hopefully, when the four arches meet at the middle of the span, there will be enough adjustment in the green traveling forms for them to all meet together to form the capstones.

Notice that slide 17 shows the X-bracing being installed between the arches at the 6^{th} and 12^{th} segments on the Nevada side. The X-bracing will also be installed at the 18^{th} and the top of the arches. Slide 23 shows the same thing for the Arizona side.

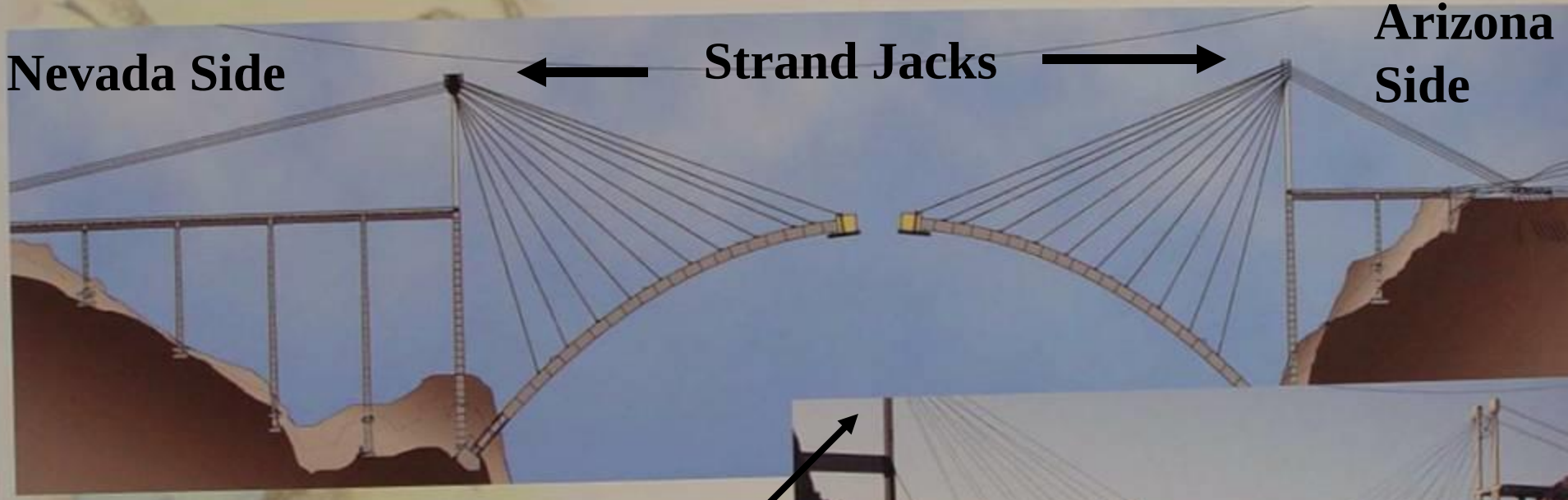
Once arch construction is complete, the backstay lines, forestay lines and the temporary towers can be removed.

After the temporary towers have been removed, piers 6 through 13 can be completed. These piers are located on the arches. The bridge beams can be placed and then the remaining deck poured.

At this point, the need for the cableways is at an end and they can also be removed. This time in a preplanned operation.

Arch Erection Method

- *Build the approach spans out to start of arch*
- *Construct temporary towers on approach spans*
- *Connect cables to support concrete arch as it is constructed in segments*
- *Remove cables and tower after arch is complete and self-supporting*



Note the 150' temporary towers located over the inboard columns

PSC Strand Jacks May Not Be The Brand Used, But Theirs Are Similar To Most Strand Jacks

PSC Heavy Lift

Heavy Lift equipment

PSC's in-house equipment (and, of course, its name) derives from over 40 years at the forefront of prestressed concrete technology.

But since 1976 equipment completely dedicated to lifting and moving has been separately and continuously developed so that today PSC has an un-paralleled range of jacks, power packs and control systems capable of prolonged, fully automated, remote operation for lifting, lowering and pulling.

This equipment is complemented by PSC's own Tower Lift support systems which include, in addition to towers, a diversity of crosshead beams, runway beams, lift beams, swivels, trunnion links and tension frames.

PSC's total operational fleet of jacks and power packs amounts to a lifting capacity of over 40,000 tonnes.

The PSC Tower Lift system resources are sufficient to permit, for instance, at least two major petrochemical vessel lifts at anytime.

Tower Lift

Tower Lift is an extremely heavy duty structural support system for use with centre hole strand jacks. It is specifically designed in modular form for ease of assembly, erection and worldwide transportation.

In its basic form it is assembled from only two members — legs and bracings. Bracings are connected to the legs by means of a single pin at each end. Two sets of connection points are provided on all legs so that the same members may be assembled in either three-leg triangular or four-leg square format towers.

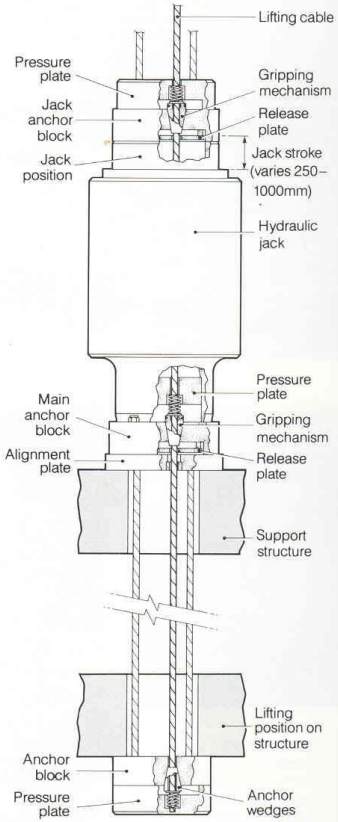
The design philosophy is to provide a support structure which requires minimal external guying for reduced site disruption.

Because of its unrivalled versatility as a temporary support structure Tower Lift can be used in varying ways to produce the most economical lifting arrangement. Examples of typical formats are:
paired towers with crosshead beams;
four-square towers with crosshead beams;
towers with tied cantilever beams;
independent luffed towers;
portalised luffed towers.

Centre-Hole Strand Jacks

PSC operates a range of jacks from 15 to 600 tonnes capacity each based upon lift cables of 1 to 37 strands of 18mm diameter, 7 wire, die-compacted, prestressing strand of guaranteed minimum breaking load of 38 tonnes per strand.

Jacks may be used singly, in pairs, or in groups to give any lifting capacity required.



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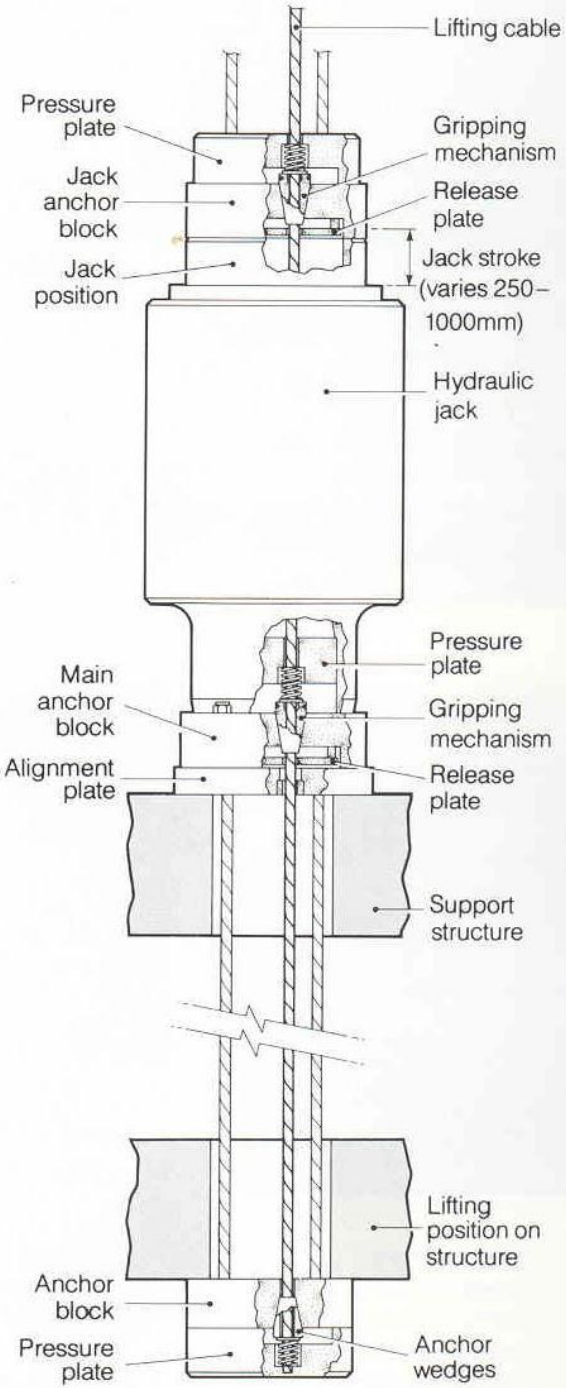
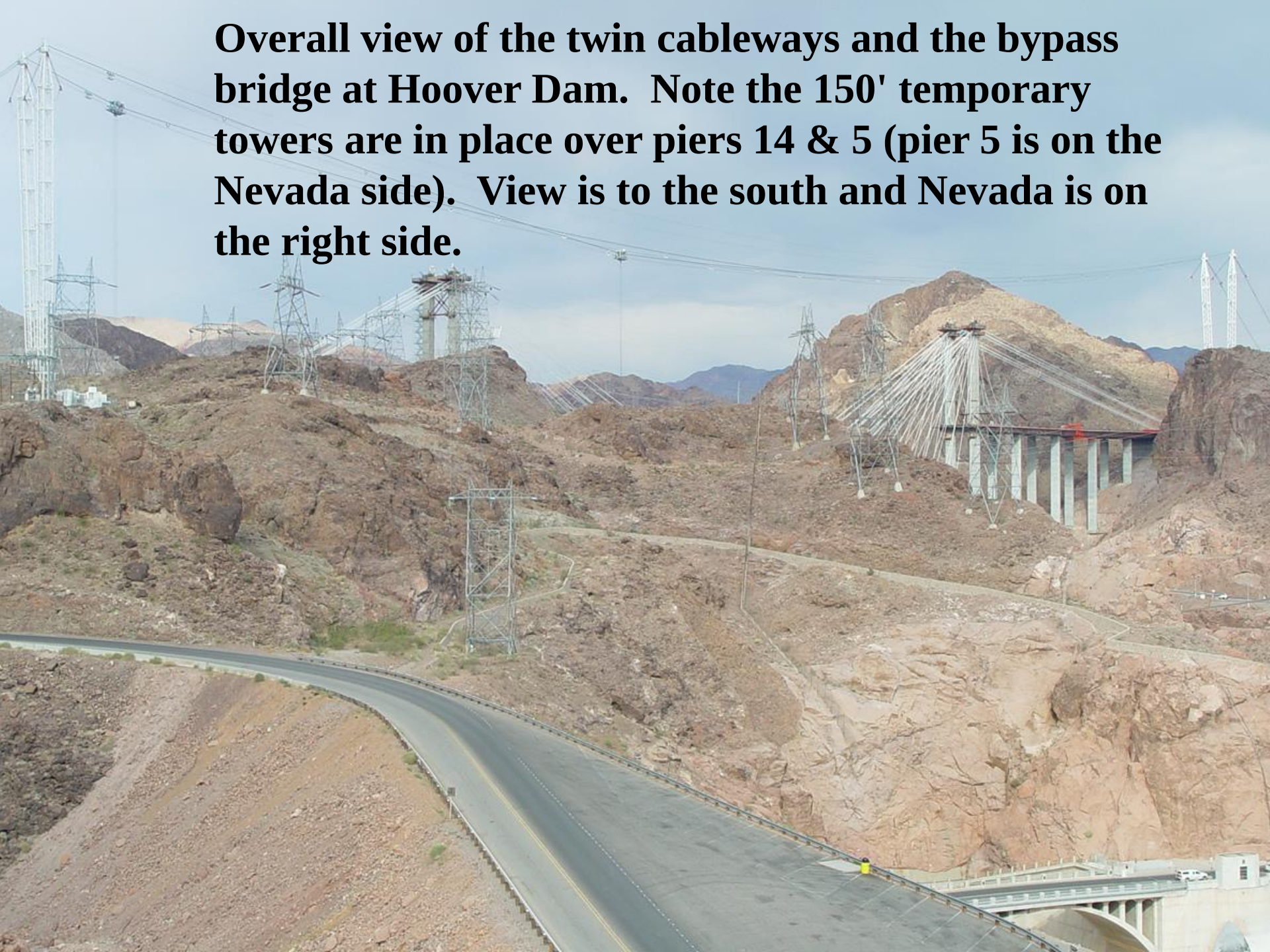
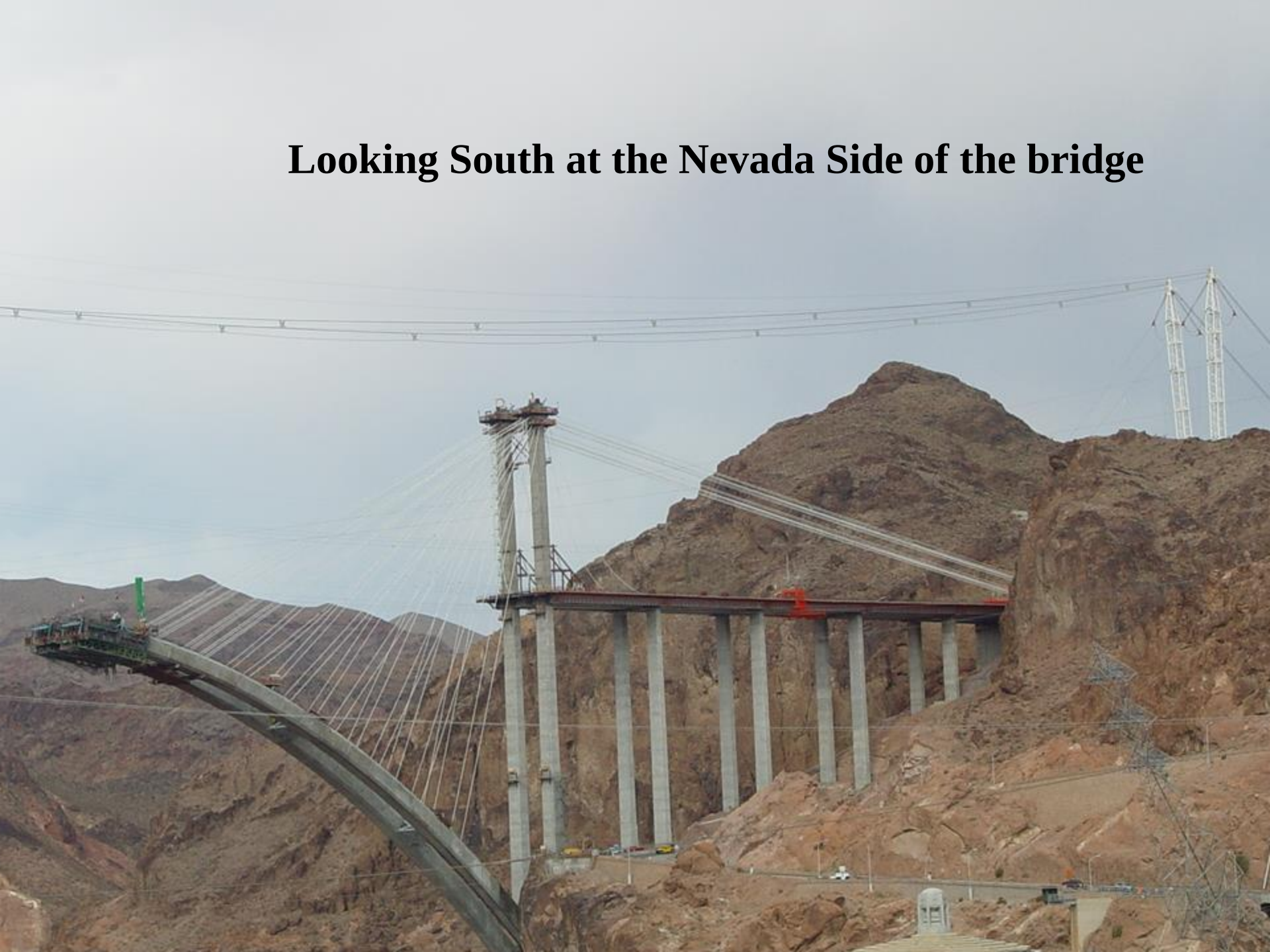

Lifting cable
Pressure plate
Gripping mechanism
Jack anchor block
Release plate
Jack position
Jack stroke (varies 250–1000mm)
Hydraulic jack
Pressure plate
Main anchor block
Gripping mechanism
Alignment plate
Release plate
Support structure
Lifting position on structure
Anchor block
Pressure plate
Anchor wedges

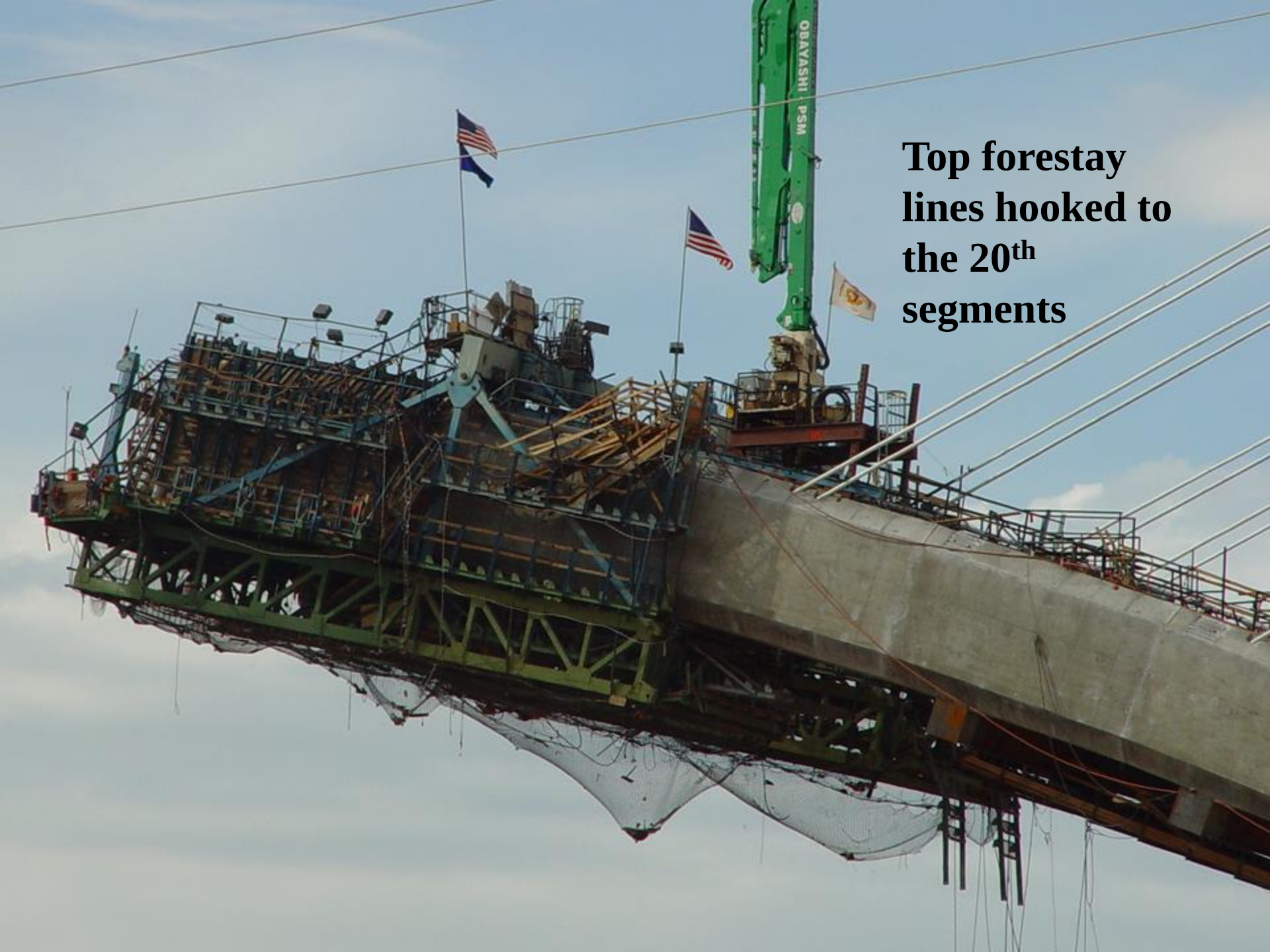


Overall view of the twin cableways and the bypass bridge at Hoover Dam. Note the 150' temporary towers are in place over piers 14 & 5 (pier 5 is on the Nevada side). View is to the south and Nevada is on the right side.

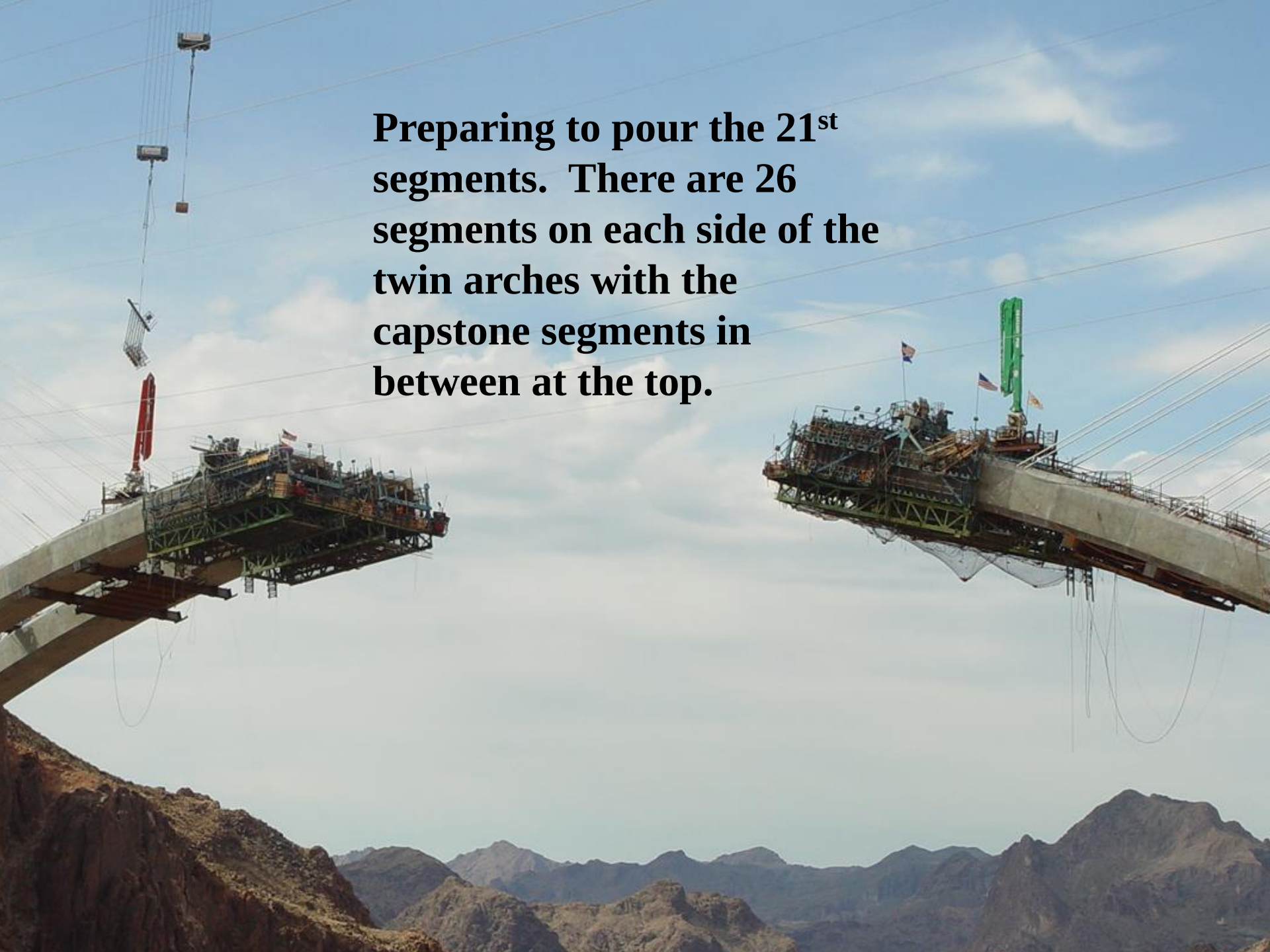
Looking South at the Nevada Side of the bridge

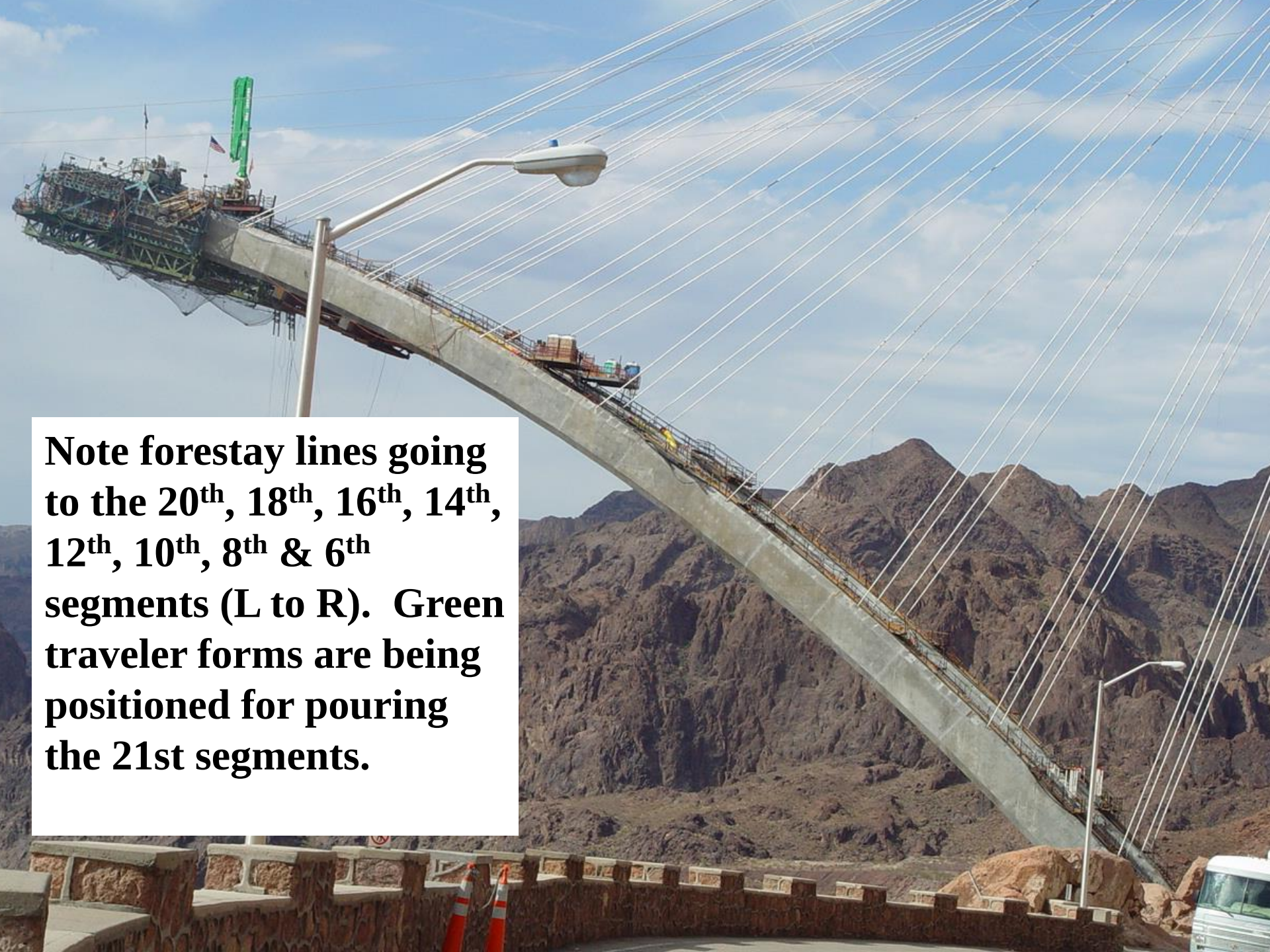



Note steel X-Bracing installed between arches at segments 6 & 12. Steel X-Bracing is in the process of being installed between the 18th segments. Note the work platform is already installed.

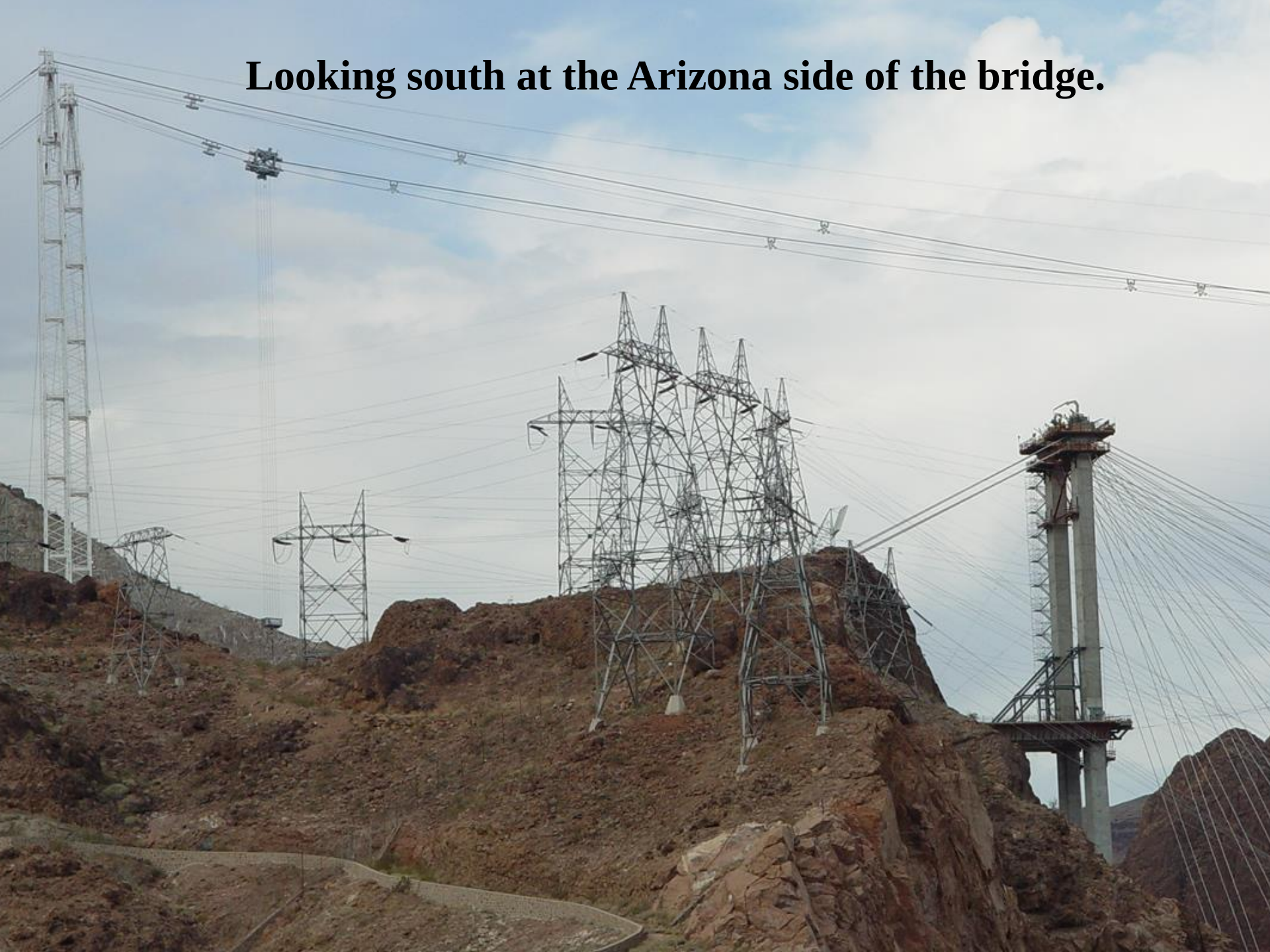


Top forestay lines hooked to the 20th segments


Preparing to pour the 21st segments. There are 26 segments on each side of the twin arches with the capstone segments in between at the top.



Note forestay lines going to the 20th, 18th, 16th, 14th, 12th, 10th, 8th & 6th segments (L to R). Green traveler forms are being positioned for pouring the 21st segments.


Looking south at the Arizona side of the bridge.

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