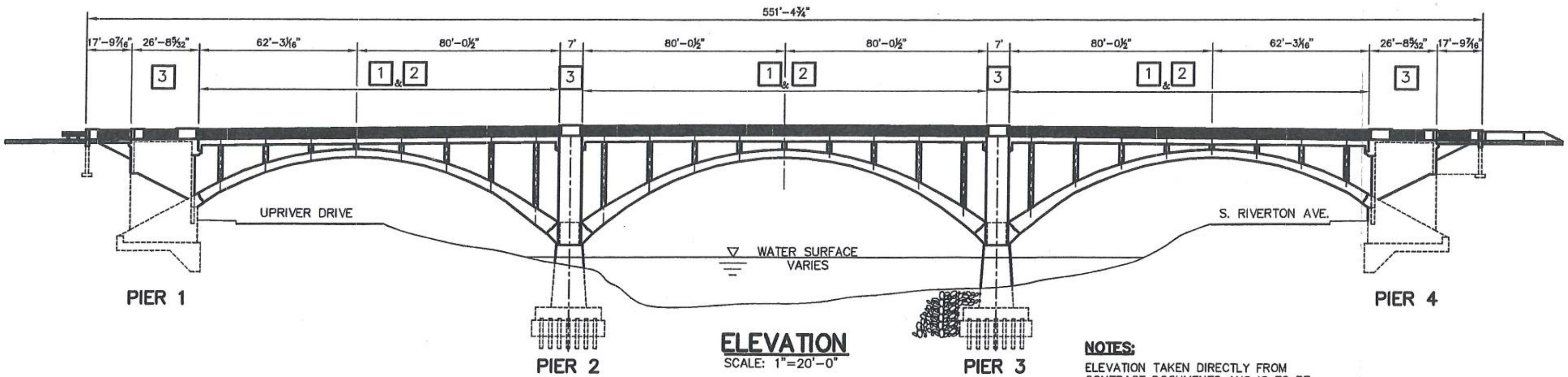

ICRI SPRING 2014 CONVENTION
RENO NV
LEEWENS CORPORATION
GREENE ST
BRIDGE
WEIGHT
LIMIT
25T
36T
40T
SPOKANE (WA) GREENE STREET
BRIDGE LOAD RATING REPAIR

THE PROBLEM ?

Aging Bridge, built to codes of 1950's

No Fire Trucks, No Heavy Trucks on major Route.



ELEVATION

SCALE: 1"=20'-0"

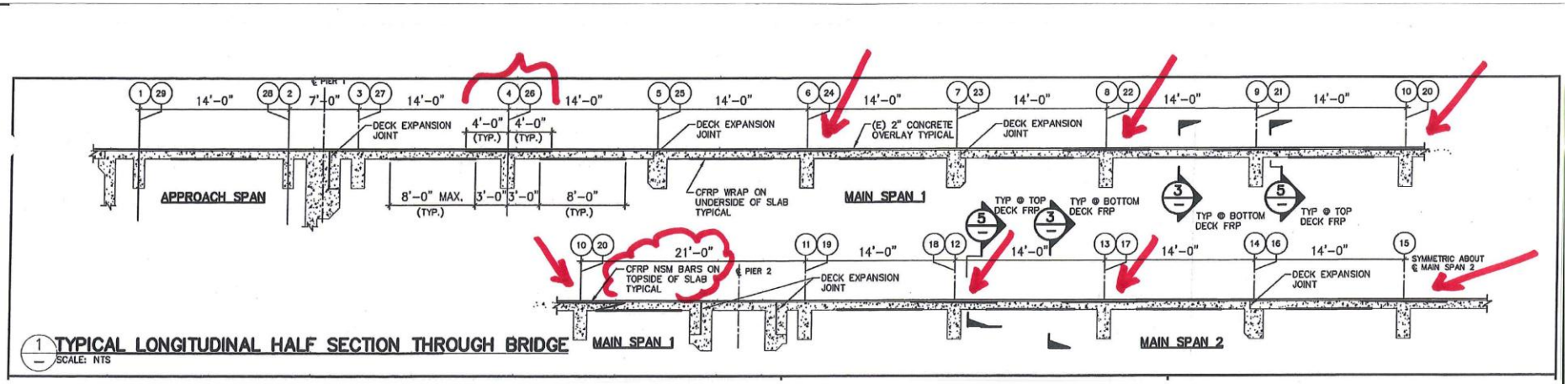
NOTES:

ELEVATION TAKEN DIRECTLY FROM CONTRACT DOCUMENTS ANS IS TO BE USED FOR REFERENCE ONLY.

CITY OF SPOKANE, WA: GREENE STREET BRIDGE LOAD RATING REPAIR	KL STRUCTURES 605 KIMBROUGH RD SEGUIN TX 78155 tel. (888) 803-3990	*Stamp:* REGISTERED PROFESSIONAL ENGINEER CIVIL STATE OF CALIFORNIA	*Contractor:* LEEWENS CORPORATION 630 7TH AVENUE KIRKLAND, WA 98033 PH. (425) 827-7667	*Revisions:*	BRIDGE PLAN & ELEVATION

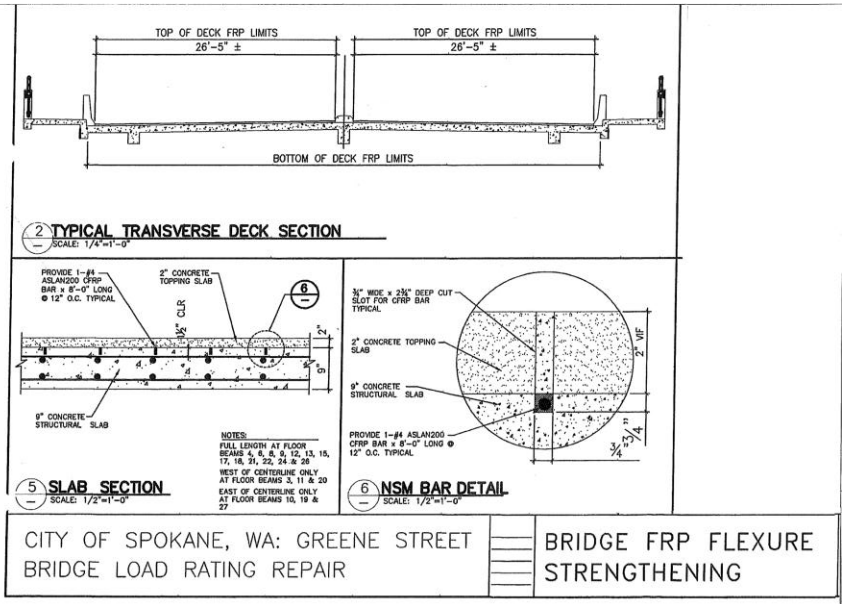
ENGINEERED SOLUTION

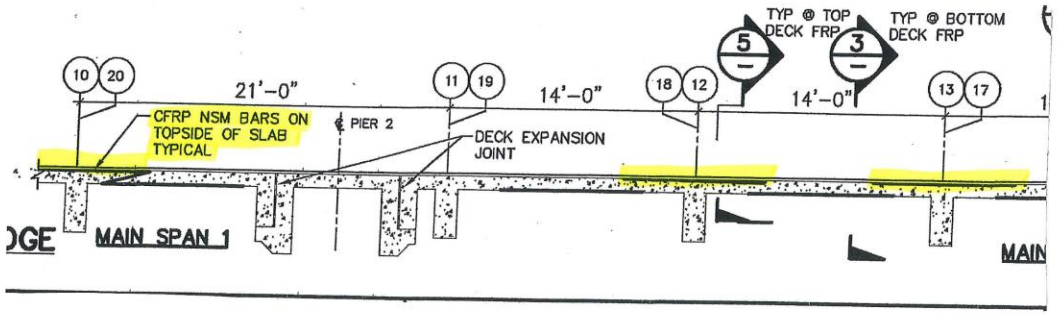
- NEAR SURFACE MOUNTED CARBON FIBER REINFORCING BAR ON TOP SIDE OF DECK

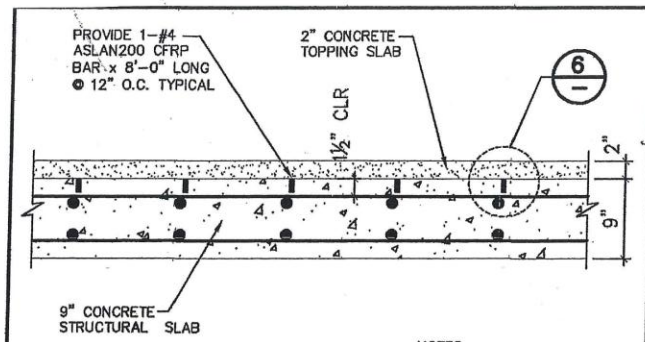


ENGINEERED SOLUTION

- ON TOP OF THE BRIDGE DECK PLACE 8 FOOT LONG 1/2’’ (#4) DIAMETER CARBON FIBER BAR INTO 3/4’’ WIDE SLOTS CENTERED OVER THE BEAMS BELOW AT ONE FOOT ON CENTER WITH THE 8 FOOT LENGTH IN THE DIRECTION OF TRAFFIC. FILL SLOT.







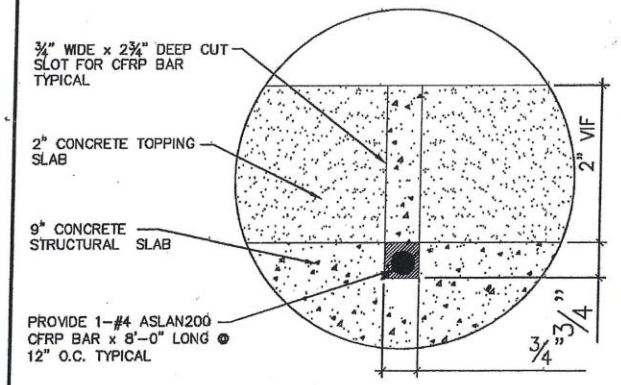
NOTES:

FULL LENGTH AT FLOOR BEAMS 4, 6, 8, 9, 12, 13, 15, 17, 18, 21, 22, 24 & 26

WEST OF CENTERLINE ONLY AT FLOOR BEAMS 3, 11 & 20

EAST OF CENTERLINE ONLY AT FLOOR BEAMS 10, 19 & 27

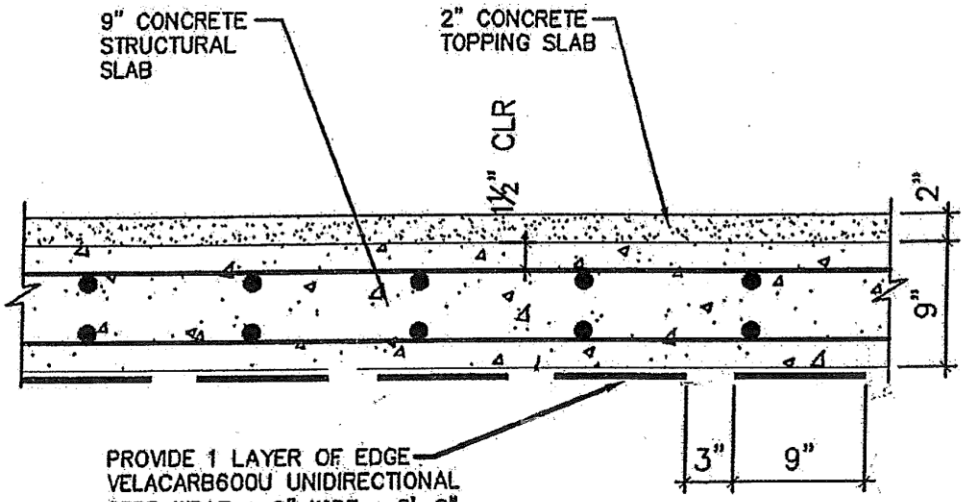
5 — SLAB SECTION
SCALE: 1/2"=1'-0"



6 — NSM BAR DETAIL
SCALE: 1/2"=1'-0"

ENGINEERED SOLUTION

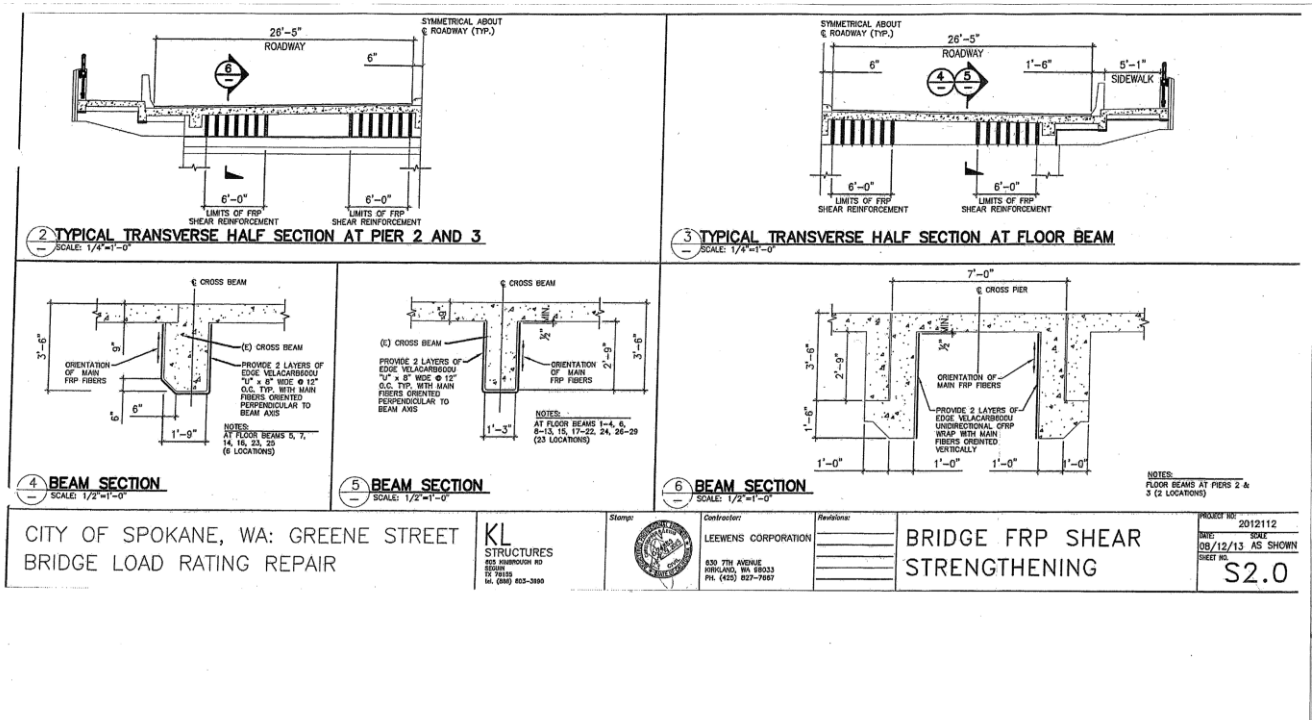
- INSTALL CARBON FIBER REINFORCED POLYMER HEAVY FABRIC 8 FEET LONG IN CENTER OF BAY ON UNDER SIDE OF BRIDGE DECK 9’’ WIDE ON 12’’ CENTERS WITH FIBERS IN DIRECTION OF TRAFFIC. APPLY TOPCOAT.

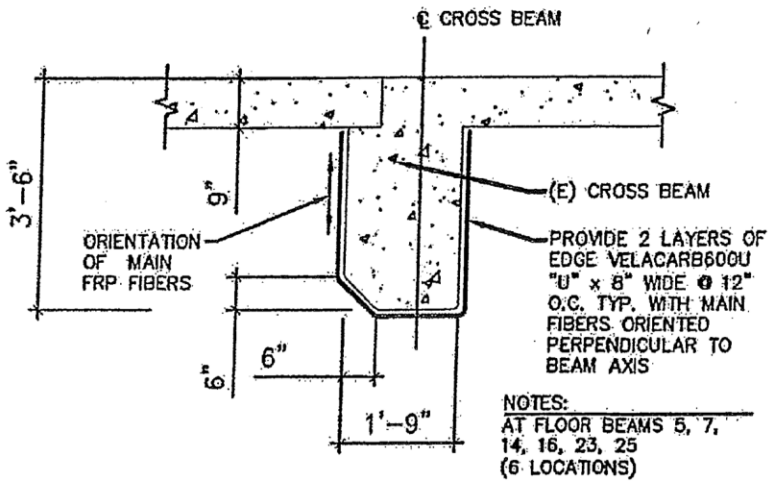


3 SLAB SECTION

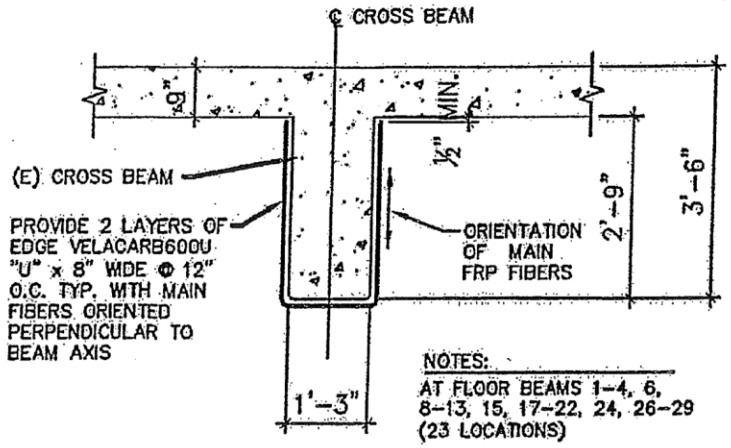
ENGINEERED SOLUTION

- INSTALL U-WRAPS OF CARBON FIBER REINFORCED POLYMER HEAVY FABRIC IN 2 LAYERS 8’’ WIDE ON 12’’ CENTERS WITH FIBERS RUNNING VERTICAL ON BEAM MIDDLE AND ENDS FOR SHEAR STRENGTHENING.





4 — **BEAM SECTION**
SCALE: 1/2"=1'-0"



5 — **BEAM SECTION**
SCALE: 1/2"=1'-0"

SCOPE OF WORK

- INSTALL NSM CFRP ROD IN TOP OF DECK
- INSTALL CFRP ON UNDER SIDE OF DECK
- INSTALL CFRP ON BEAMS UNDER DECK

- ELEGANT, SIMPLE DESIGN

- THE DEVIL IS IN THE DETAILS !

DETAILS


FIRST SITE VISIT JULY 18 2013
QUESTIONS DUE JULY 23 2013
BID DATE JULY 29 2013
7 DAY AWARD WINDOW
40 WORKING DAY SCHEDULE !!!

WE RECEIVED ANSWERS TO OUR 3 KEY QUESTIONS:

HOW MUCH CONCRETE IS OVER THE STEEL REINFORCING BAR IN THE STRUCTURAL SLAB?

2 INCHES

HOW MUCH EPOXY INJECTION IS THERE TO BE DONE?

NONE

HOW MUCH CONCRETE REPAIR IS THERE TO BE DONE?

$2,000

FIRST SCOPE OF WORK NEEDED TRAFFIC CONTROL. WE WERE ALLOWED TO CLOSE TWO OF THE FOUR TRAFFIC LANES FOR THE ENTIRE DURATION OF THE PROJECT.

SLOTS WERE LAID OUT IN THE PROPER LOCATION, CUT AND CLEANED WITH SLURRY AND WATER COLLECTION, SLOTS WERE CHECKED FOR WIDTH AND DEPTH, AND CARBON FIBER BARS WERE SET INTO THE SLOTS AND FILLED WITH EPOXY, THEN TOPPED WITH GROUT.

FILLING THE SLOTS WITH EPOXY TO THE TOP OF THE STRUCTURAL SLAB

SURFACES WETTED, THEN BLOWN DRY OF FREE WATER FOR CEMENTITIOUS GROUT FILL OF TOPPING SLAB.

THE GREEN IN THE BOTTOM OF THE SLOT IS CURED EPOXY OVER THE CARBON FIBER BAR.

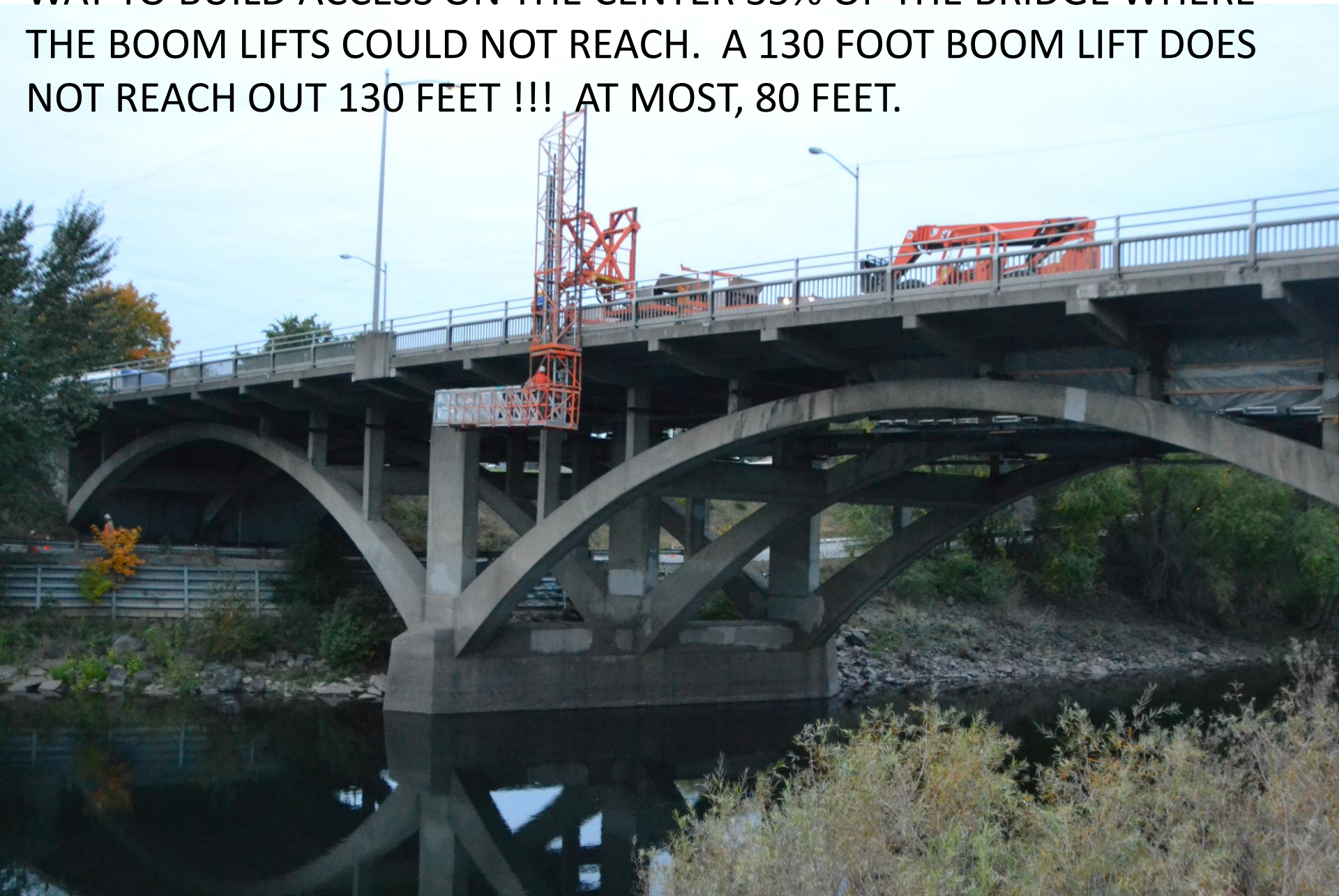
FILLED SLOTS BEFORE TRAFFIC

FOR ACCESS WE UTILIZED 3 BOOM LIFTS AND TWO SCISSOR LIFTS FOR THE EASY AREAS…

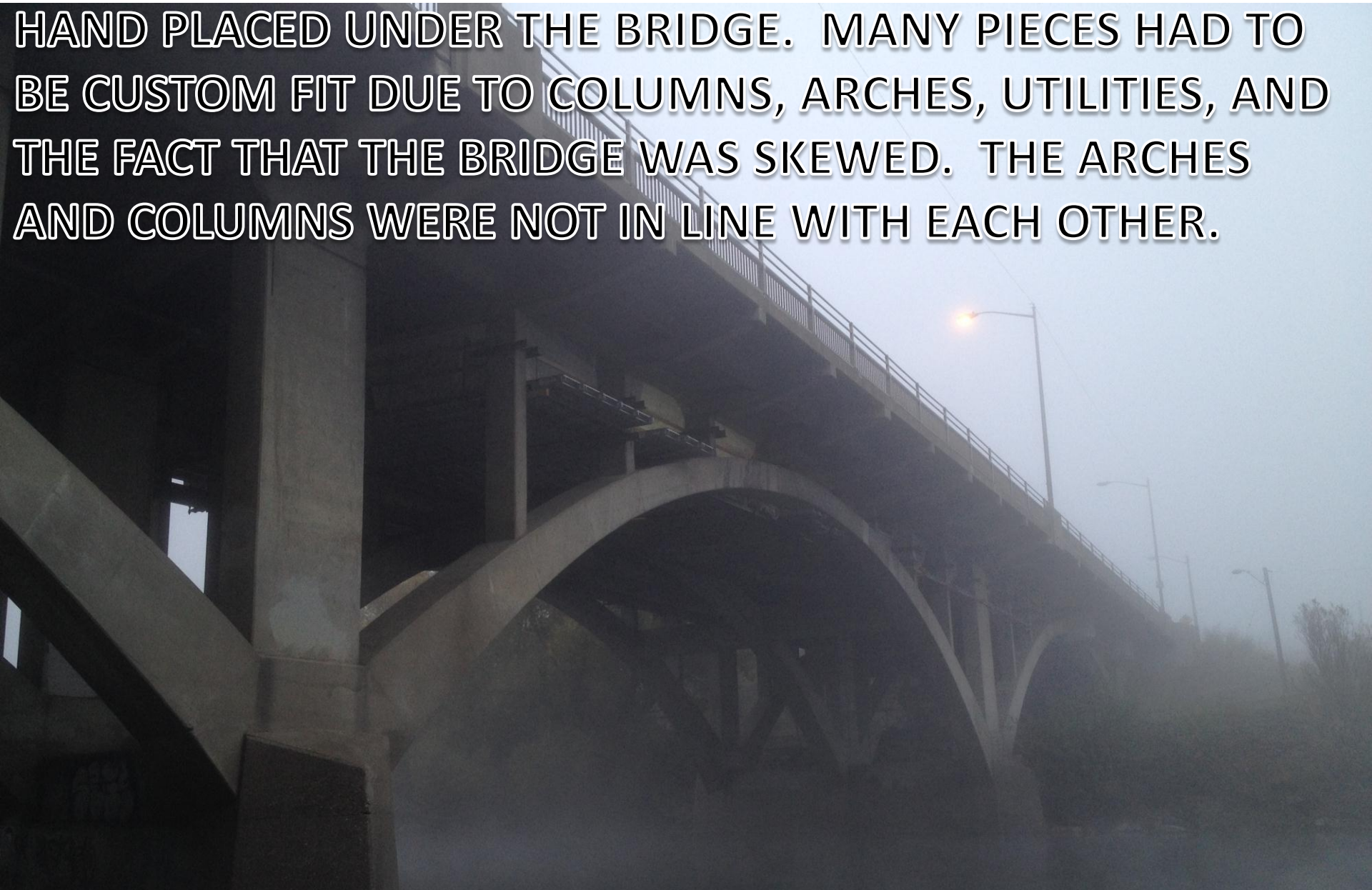
OF THE TWO UBITS THAT WERE BROUGHT TO THE JOB, ONLY ONE COULD BE MADE TO FIT.

WE HAD TO RAISE THE UBIT UP SAFELY 4” – 4 SECTIONS 1200 LBS EA.

SHORT OF USING A BARGE FOR A PLATFORM, THE UBIT WAS THE ONLY WAY TO BUILD ACCESS ON THE CENTER 35% OF THE BRIDGE WHERE THE BOOM LIFTS COULD NOT REACH. A 130 FOOT BOOM LIFT DOES NOT REACH OUT 130 FEET !!! AT MOST, 80 FEET.



OUR WORKING PLATFORM WAS CUSTOM ENGINEERED, CUSTOM BUILT, COMPLETELY OUT OF PARTS THAT HAD TO BE HAND PLACED UNDER THE BRIDGE. MANY PIECES HAD TO BE CUSTOM FIT DUE TO COLUMNS, ARCHES, UTILITIES, AND THE FACT THAT THE BRIDGE WAS SKEWED. THE ARCHES AND COLUMNS WERE NOT IN LINE WITH EACH OTHER.



THIS RESULTED IN MANY PARTS AND PIECES CUT OFF AND LEFTOVER !

WE DECIDED TO DO THE ACCESS OURSELVES BECAUSE WE HAVE DONE THIS BEFORE, BECAUSE THE BIDS WE RECEIVED WERE VERY HIGH AND CONSUMED MOST OF THE SCHEDULE JUST FOR PUTTING IT UP, NEVERMIND ACCOMPLISHING THE WORK AND REMOVING IT. THIS WAS A KEY RISK FACTOR TO THE ENTIRE PROJECT. YOU NEED TO HAVE A COMPETENT PROFESSIONAL ENGINEER WHO UNDERSTANDS ALL OF THE REQUIREMENTS ALONG WITH THE MANY RESTRICTIONS IN THE FIELD. WE NEEDED TO ACCESS AN AREA 56 FEET WIDE AND 458 FT LONG AND 40 FT HIGH OVER WATER, ROADS AND COMPLETELY UNDER A DECK.

WE ALSO USED SYSTEMS SCAFFOLDING INSIDE THE BOX STRUCTURES AT EITHER END OF THE BRIDGE UNDER THE APPROACH SPANS.

UNDERNEATH THE BRIDGE DECK, CRACKS ARE UNCOVERED.

WE WERE DIRECTED TO INJECT CRACKS OVER 10 MILS IN ACCORDANCE WITH ACI 440.2R08

QUANTITY OF CRACKING VARIED FROM BEAM TO BEAM AND IN BRIDGE DECK.

TOTAL CRACKS INJECTED WERE OVER 6,000 LINEAL FEET.

THIS ADDED SEVEN DAYS OF DELAY, AND ADDED OVER THIRTY WORK DAYS TO THE JOB. WE NOW NEEDED A LARGER QUANTITY OF WORK DECK TO KEEP UP ALL THE ACTIVITIES. THE JOB WAS PUSHED INTO DECEMBER, REQUIRING HEAT TO KEEP THE SUBSTRATE AND MATERIALS WARM. GENERATORS AND 480 VOLT HEATERS WERE MOBILIZED JUST IN TIME FOR VERY COLD WEATHER. TEMPERATURES WERE AS LOW AS 6 DEGREES F.

SMOOTHING AND CLEANING OF CONCRETE ALONG WITH REMOVAL OF LAITANCE WITH SHROUD AND DUST COLLECTION AT THE SOURCE, UTILIZING AGGRESSIVE DIAMOND BLADES FOR PROFILE.

HERE YOU SEE PULL TESTS, WHICH WERE DONE LIKE THESE FOR EACH DAYS' WORK OR 500 SF

EPOXY PRIMER ON PREPARED CLEAN CONCRETE

PREPARED AND PRIMED CONCRETE WITH INJECTED CRACK

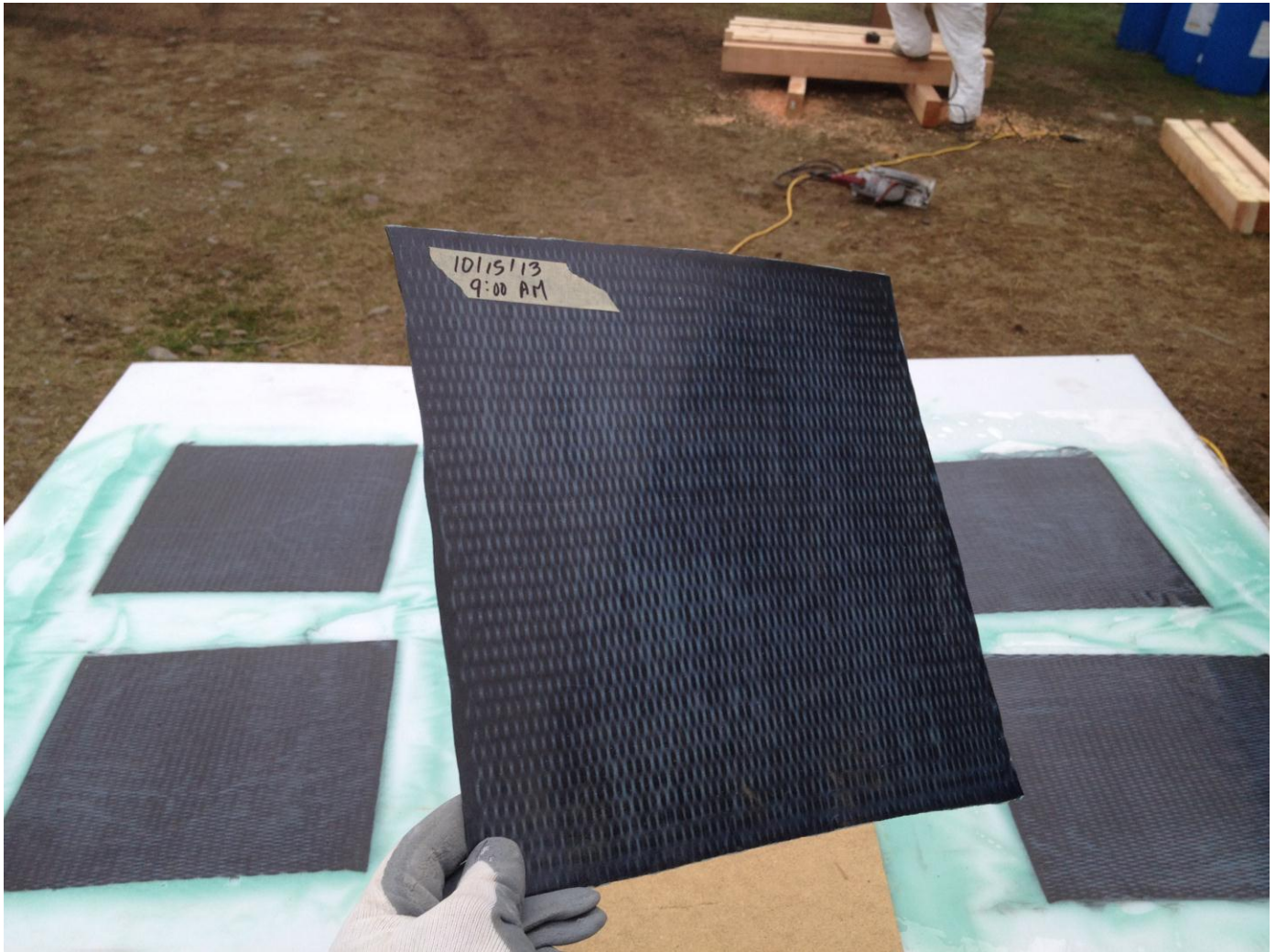

CARBON FIBER BEING PUSHED INTO
WET EPOXY AND SMOOTHED


SATURANT APPLIED BY ROLLER

VERTICAL U-WRAP STRIPS FOR SHEAR – TWO PERSON JOB PER STRIP


TOP COATING STARTED ON LEFT

WITNESS PANELS FOR LAB TESTING, PERFORMED ON SITE DAILY AND CURED IN ACTUAL CONDITIONS – ASTM D3039



THEFTS EVERY NIGHT !!! DIESEL BATTERIES CORDS PUMPS

MAYOR CONDON AND THE MEDIA REMOVING THE WEIGHT RESTRICTIONS

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INSTALLATION OF FLOOR COATINGS AND SURFACERS, SPECIAL COATINGS, PLASTIC LINERS, ELASTOMERIC DECKING, ROOFING, WATERPROOFING, AND EPOXY OR URETHANE INJECTION. CONCRETE REPAIR, PROTECTION, AND STRENGTHENING

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