Effecting a Major Road Repair in Baghdad

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Just days after completing a relief-in-place/transfer of authority with its predecessor, Task Force Black Diamonds deployed engineer assets off a secure base camp for the first time in support of Multinational Division–Baghdad. The task force was formed around the 92d Engineer Battalion (Combat) (Heavy) as part of the 36th Engineer Group (Combat). The task force consists of a headquarters and support company, two combat heavy engineer line companies, a United States Army Reserve combat heavy engineer line company, a chemical company, and an Army National Guard utilities detachment. The mission was to repair three road craters on a corps main supply route. Using some form of improvised explosives placed deep inside existing culverts, anti-Iraqi forces had created the craters along a three-lane road, which closed the westbound lanes to civilian traffic.

Engineer Reconnaissance

An engineer reconnaissance revealed that the craters averaged more than 40 feet in diameter and 8 feet in depth. Key leaders gathered to disseminate the results of the reconnaissance and receive the battalion commander's initial guidance before developing courses of action. The intelligence staff officer's (S-2's) engineer preparation of the battlefield revealed a pattern of anti-Iraqi force activity in the area where engineers would be traveling and working. Terrain analysis at all three crater locations showed that an eastbound three-lane road, set apart by a 10-meter-wide dirt median, paralleled the three westbound lanes. Because the westbound lanes were closed, there was significant civilian traffic on the eastbound lanes in both directions except during nightly curfews. At times, civilian vehicles also traveled on a one-lane dirt road that paralleled the damaged road to the north. An extended area of one- to three-story buildings flanked the eastbound lanes. The area to the west of the craters was an open field, dominated by a high earthen berm near the road. The security plan would have to address these concerns while on-site as well as while moving to and from the crater locations.

Course of Action

Photographs and measurements of each crater were used to develop a course of action. Labeling the craters from west to east, Crater A was 1.5 kilometers west of Craters B and C, which were just 50 meters apart. Concept sketches were developed to repair all three craters simultaneously or in groups. The battalion commander's guidance was to repair Crater A first, then repair Craters B and C simultaneously. This would potentially increase the total time spent on-site, but by using maneuver and aviation assets for security, the risk would be mitigated and the engineer footprint would be relatively small. The engineer assets task-organized for the mission included elements from the Reserve line company's horizontal construction platoon and one of its vertical construction

platoons, along with haul assets from the headquarters and support company's heavy equipment platoon.

Crater A

Final refinement of the plan further delineated each crater repair into three distinct phases:

- **Phase I** consisted of mobilizing and deploying horizontal engineer assets to clear blast debris from the crater and repair the road base (see photo on page 15). Required equipment included a vibratory roller, a front-end loader, a hydraulic excavator (HYEX), a bulldozer, a Bobcat®, two M916 tractors with M870 trailers carrying Texas "T" concrete barriers (which served as vehicle-borne improvised explosive device [VBIED] blast shields), and five 20-ton dump trucks. Two of the trucks were loaded with fill, while the remaining trucks carried crushed limestone. To minimize the fill required to repair the subbase, blast debris from the craters was used for backfill. Clean fill was deposited on top of the blast debris in layers and compacted. An 8-inch lift of crushed limestone was used as the base for the 10-inch-thick reinforced concrete wearing surface.
- **Phase II** began once the roller started to compact the layer of limestone. Engineers from the vertical construction section prepared the required formwork and placed the reinforcing steel. The section consisted of a squad, a trailer-mounted 250- cubic-feet-per-minute (CFM) air compressor, a 5-ton dump truck, and several masonry kits. The dump truck's bed was raised and used to drop the prefabricated forms and rebar mats onto the road surface. The forms were used where the crater had breached the road shoulder. The bars of the rebar mats were tack-welded to reduce fabrication time, allow rougher handling in transit, and increase the speed of emplacement.
- **Phase III** consisted of the actual concrete placement. A local contractor provided the concrete for the pour. The vertical section Soldiers were the only ones on the ground to work the concrete into the form, and the engineer Soldiers provided local security. For Crater A, Phases I and II took place on Day 1 of the mission. Phase III, which required five truckloads of concrete (approximately 40 cubic yards), took place on Day 2. Since five concrete trucks were never available at one time, engineer Soldiers had to wait while the trucks returned to the batch plant to be reloaded. Turnaround times for this mission ranged from 45 minutes to 3 hours depending on traffic, route conditions, and camp gate access. Using a concrete additive decreased its curing time, allowing the crater repairs to be completed and the road available for traffic much sooner.

Craters B and C

Plans for repairing Craters B and C were refined using lessons learned while repairing Crater A. During initial movement to the location of Craters B and C, the engineer lieutenant in charge staged a heavy, expanded-mobility tactical truck (HEMTT) wrecker, the 20-ton dump trucks, and the vertical section's equipment in preparation for Phases II and III on Craters B and C. Engineer assets would be called forward from the rally point as required to minimize the size of the engineer footprint on-site. During the military decision-making process (MDMP), it was difficult to determine how much usable fill material was in each crater. By using the asphalt and

A local contractor provided the concrete that Task Force Black Diamonds placed to repair Crater B.

A Task Force Black Diamonds Soldier uses a float to finish the repair of a crater after the vibrating and screeding process.

blast debris from Crater A to repair the subbase—and removing the large, unwieldy pieces—the horizontal construction section only had to bring in fill equal to roughly 25 percent of the crater volume. Craters B and C were so close to each other that the engineers determined that the horizontal section could start Phase I on Crater C while the vertical section executed Phase II on Crater B without increasing the number of 20-ton dump trucks required. On Days 3, 4, and 5, engineers hauled and placed one 20-ton load of blast debris taken from Crater A, two loads of fill, and four loads of crushed limestone per day. On Day 4, they placed 40 yards of concrete and repaired Crater B. On Day 5, they placed 64 yards of concrete and repaired Crater C.

Lessons Learned

There are several key lessons learned from this repair mission:

- Troop-leading procedures and the MDMP are vital to the preparation of executable plans and must be fully understood at all levels of command.
- Engineers must proactively develop a security plan that integrates maneuver units with engineers in an urban environment to take advantage of the maneuver units' ability to observe larger areas at greater distances than the engineers.
- Planning rally points near project sites allows equipment to be staged off-site and reduces the number of vehicles exposed to anti-Iraqi force attacks.
- Prefabrication of rebar mats and forms limits the time Soldiers are exposed on-site.
- Control measures during the MDMP must be incorporated into the security plan to mitigate the stress on site security caused by civilians on the battlefield.

Conclusion

During the repair of the three road craters, Task Force Black Diamonds placed 144 cubic yards of concrete over a five-day period. The concrete was given three days to cure before the route was reopened to military and civilian traffic. It has remained open ever since without needing repairs, despite being struck by additional mortar rounds. The task force continues to provide construction engineering and chemical force protection to Iraqi army, Iraqi police, and U.S. Army units within the supported area of responsibility in both complex urban terrain and more rural locations.

Black Diamonds—With Pride!

For additional information, or to get a copy of this article that discusses in more detail the specific tactics, techniques, and procedures used by the task force, contact the battalion via Secret Internet Protocol Router Network (SIPRNET) or contact <*James.L.Moore@us.army.smil.mil*>.

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