Interstate 20 Improvements near Birmingham, Alabama. A Case History in Innovative Teamwork, Project Safety and Final Results

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‘Nothing in life is so exhilarating as to be shot at without result.’

Winston Spencer Churchill
Overview

- Aging Interstate rock slopes
- Past blasting practices and legacy issues
- Non-Geotech Design Review on Improvements
- Non-Construction Interests
- I-20 Design Development
- Rock Slope Concerns
- Design/Construction Modifications
- What was going to happen happened – without result.
- Acknowledgements – why it worked
Aging Interstate Rock Slopes
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Past Blasting Practices and Legacy Issues
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I-287/87 rebuilding begins

New York State Thruway Authority crews clean up crushed rock and debris yesterday on Interstate 87 at the Interstate 287 split after the first round of rock blasting in a major exit renovation project.
Past Blasting Practices and Legacy Issues

RCA9-2 Blast #2
3/28/01

WRIGHT BROTHERS
CONSTRUCTION COMPANY, INC.

KESCO

Golder Associates
The worst that can happen

Massive rockslide kills 2

A story of road beneath a huge build-up has been the subject in a rockslide on Saw Mill Run Boulevard yesterday afternoon that killed two men and seriously injured another.

The 2:41 p.m. slide occurred just 10 minutes after workers had let off five small explosive charges in the steep positions near the intersection of the boulevard between Woodruff Street and Grant Avenue.

John Lutowska, president of the Construction Co. of Canonsburg, Washington County, which had a city contract to clear the area, said that the blasting may have been insufficient and that the explosion itself was not enough to cause it to collapse on the roadway about 60 feet below.

The men were killed, and two others were injured. The men were killed instantly.

The slide then crashed a white Ford F-350 with Ohio license plates and the cab of a Kenworth tractor-trailer truck. The extent of the F-350 was killed, while the truck driver was thrown from his seat and was found in critical condition.

The slide also injured two workers, both of whom were able to escape. The truck driver was flown to a hospital and was in critical condition.

The company is being assisted by rescue workers from North Honolulu, Ohio. The truck driver's name was being withheld by county coroner's officials pending notification of next of kin.

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Interstate 20 East of Birmingham

Location of through-cut on I-20 to be widened.
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Cut is through sandstones and metaquartzite transitioning eastward to sandstone over shale

Original construction cuts in hard units were steep – probably ~ 4-on-1 (65-75 degrees after aging)

Shales standing at 60 degrees with shotcrete and 50 degrees unarmored

Open bedding planes and joints on the face suggesting backbreak up to 30 feet.

Initial Design (2003) had cuts of 20 to 30 feet westbound and 15 to 25 feet eastbound – project delayed by Katrina…
2003 Design (Sitz) for 2005-2006 Letting
Project Let in 2009 – awarded to Wright Bros.
I-20 Key Issues

- Project Arrangement and Setting
- High traffic volume (ADT~ 75000) on two-lane barrels
- Limited travelled lane offset from rock slopes
- Tall, slender cuts – all in backbreak - can only cast toward the roadway
- Observable wedge scarps open joints and thrust faults – would large wedges come out as before?
Addressing Key Issues

- Staging Construction – Constructing Eastbound side first to make room
- Adjusting slope angles to be shallower than geologic features.
- Shifting traffic to the new median to provide catchment at the toe of the westbound slopes
- Blasting at night when traffic was least intense (least impact to stakeholders) – you need a thinking blaster, not the cheapest…..
- Be prepared for a slow wedge failure – with room and equipment for rapid clean up.
Staging Construction – Constructing Eastbound Side First to Make room
Adjusting slope angles to be shallower than geologic features.
Shifting traffic to the new median to provide catchment at the toe of the westbound slopes
Blasting at night when traffic was least intense (least impact to stakeholders)
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Be prepared for the slow wedge failure with room for catchment
Be prepared for the slow wedge failure with room for catchment
What was going to happen, happened – without result
Key Approach Elements for Success

- Ensure the slope design is kinematically stable;
- Consider Construction constraints – give the blaster room to turn the blast to cast parallel to live roadway
- MPT – work with traffic control to get active lanes as far as possible from blasting.
- Blast during off-peak hours.
- Stage Construction to accommodate adverse conditions
- Engage stakeholders, owner, designer, and contractor to work together to address difficult conditions.
What was going to happen, happened – without result

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