

BASIS OF DESIGN

**ILLINOIS CEMENT DIMMICK MINE
EAST 3RD ROAD RELOCATION**

Prepared for:

ILLINOIS CEMENT

Prepared by:

**CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
LOMBARD, ILLINOIS**

CEC PROJECT 173-594

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ATTACHMENTS

- ATTACHMENT 1 – IDOT BDE CHAPTER 32 RELEVANT SECTIONS**
- ATTACHMENT 2 – IDOT BDE CHAPTER 54 RELEVANT SECTIONS**
- ATTACHMENT 3 – ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST**

1.0 PROJECT UNDERSTANDING

1.1 PROJECT BACKGROUND

The Illinois Cement Company (ICC) owns and operates a limestone mine in the City of LaSalle (City), LaSalle County (County), Illinois known as the Dimmick Mine. The mine site is located approximately one-half mile north of Interstate 80 and immediately east of East 3rd Road. In order to take advantage of additional nearby limestone reserves, ICC has acquired existing contiguous land to the north and west of the existing mine and is considering various mining options for these properties.

One option being considered is the temporary relocation of East 3rd Road further west which would enable current mining operations to proceed westward through the existing East 3rd Road location; however, it is unknown if this option would be preferable versus leaving the existing East 3rd Road in place and mining around it. East 3rd Road does not currently have a dedicated right-of-way (ROW), however, the City acquired jurisdiction for operation and maintenance of the road as part of the annexation of ICC property to the City. As such, relocation would be subject to approval by the City.

ICC is interested in gaining a better understanding of the costs associated with the relocation of East 3rd Road and has engaged Civil & Environmental Consultants, Inc. (CEC) to provide a concept plan and opinion of costs for the relocation. With this information, ICC will be able to make more informed business decisions relative to future mining operations.

1.2 SCOPE OF WORK

As summarized in an email from Brad Renwick, CEC, to Jerry Crittenden, ICC, on Friday, September 8, 2017 at 3:39 p.m., CEC's scope is to prepare concept plans (~30% design) and a preliminary cost estimate (+/- 20%) for a curve-linear relocation of East 3rd Road at the Dimmick Mine. Several other layout possibilities were originally discussed including a "squared-off" concept that would route East 3rd road around the perimeter of ICC-owned property in a perpendicular fashion. The "squared-off" concept would require new intersections and stop signs and result in a longer roadway relocation.

For various reasons, the squared-off concept was dismissed in favor of the curve-linear concept; however, ICC is still interested in the potential cost difference between the curve-linear and squared-off concept. Additionally, ICC is interested in the cost to reconstruct East 3rd Road in its current location at a future time when mining operations are complete. The opinions of cost associated with these two improvements will not include a concept design, but will instead be prepared by determining an approximate roadway length and utilizing cost data determined for the curve-linear concept.

Deliverables for the work include:

- Concept plans for the curve-linear East 3rd Road relocation.
- An engineer's opinion of probable construction cost for the curve-linear East 3rd Road relocation (based on concept plans).
- An engineer's opinion of probable construction cost for the squared-off East 3rd Road relocation (based on length and curve-linear cost data).
- An engineer's opinion of probable construction cost for the East 3rd Road replacement (based on length and curve-linear cost data).
- Documentation of the various assumptions and analyses utilized to produce the concept plan and opinions of cost (this document).

2.0 DESIGN SUMMARY

2.1 EXISTING CONDITIONS

A field visit was performed on October 23, 2017 to assess and document the existing conditions of East 3rd Road at the proposed beginning and end point of the relocation, and of North 31st Road at the approximate location that the proposed East 3rd Road relocation will cross it.

2.1.1 South Side Connection Near Station 10+00

At the south connection to existing East 3rd Road, the roadway was observed to be asphalt and was approximately 20 to 21 feet wide with 1- to 3-foot wide aggregate shoulders on either side. Existing asphalt condition was fair. Shallow vegetated ditches were observed on both sides of the road. Overhead electric lines were located on the west side of the road. A 30-miles-per-hour (mph) speed limit sign for southbound traffic was present approximately one-quarter mile south of the proposed connection point. No other speed limit signs were observed immediately south of the mine or along East 3rd Road adjacent to the mine. Vehicles were observed travelling generally in the range of 45 to 55 mph on East 3rd Road adjacent to the mine. A "weight limit 27 tons" sign was posted just north of the ICC Dimmick Quarry main entrance drive for northbound traffic.

2.1.2 North Side Connection Near Station 70+18

At the north connection to existing East 3rd Road, the roadway was observed to be asphalt and was approximately 20 feet wide with 2-foot wide aggregate shoulders on either side. Existing asphalt condition was good. Shallow vegetated ditches were observed on both sides of the road. Overhead electric lines were located on the west side of the road. In a drive north of the north connection point to review posted speed limits, no additional speed limit signs were observed up to North 33rd Road or looking further north, a distance of roughly 2 miles. A "weight limit 27 tons" sign was posted just north of the north side connection point.

2.1.3 Crossing at North 31st Road near Station 35+13

At the approximate location of the relocated East 3rd Road crossing of North 31st Road, the roadway was observed to be asphalt and was approximately 20 feet wide with 2-foot wide overgrown aggregate shoulders. Existing asphalt condition was good. Shallow vegetated ditches were present on both the north and south side of the road.

2.1.4 Other observations

Existing ground surface grades were very flat but appeared to have a general west to east, and south to north tendency. Existing roadways had a slight crown to shed water to the ditches on both

sides. A broken asphalt edge at the intersection of North 31st Street and East 3rd Road revealed an existing 3- to 4-inch thick asphalt surface; however, without pavement coring this cannot be confirmed. The asphalt appeared to be underlain with aggregate.

2.2 DESIGN CRITERIA

2.2.1 Design Codes, Standards, Laws, and Ordinances

East 3rd Road is under the jurisdiction of the City of LaSalle and, therefore, subject to the requirements of the City Code of Ordinances. In a review of the compiled City Code of Ordinances, no specific requirements relative to roadway design were present. As such, the standards and design guidelines of the Illinois Department of Transportation (IDOT) will be referenced for the purposes of the concept design.

The proposed roadway relocation will be subject to approval by the City. The relocation would require vacation of the existing East 3rd Road ROW and granting of a new ROW centered upon the relocation. For the City to approve, they will require a Petition from ICC for the relocation and they will likely require a public hearing to obtain feedback from the community. An E3rd Road Closure Study, dated March 2016 and performed by Chamlin & Associates, Inc. (Chamlin Report), addresses some of the impacts anticipated by the relocation that will be subject to City/public review. Other information may be requested for City and public review prior to City action.

It is anticipated that the City will be the primary approval party to facilitate the relocation; however, other federal, state, county, and local regulations may apply. These generally may include:

- United States Army Corps of Engineers: Permit and mitigation may be required if the project is determine to impact wetlands (none anticipated but a wetland investigation may be required).
- Illinois Department of Natural Resources: Approval process may be required to confirm the relocation does not result in ecological impact to threatened or endangered species.
- Illinois Environmental Protection Agency: Since the relocation will disturb more than 1 acre of land, it will require coverage under National Pollutant Discharge Elimination System Permit ILR10 for Storm Water Discharges From Construction Site Activities. A stormwater pollution prevention plan (SWPPP) and a Notice of Intent (NOI) will need to be prepared and submitted to gain coverage.

Other permits/approval may be required.

2.2.2 Design Assumptions

The following assumptions were used in the preparation of the concept roadway design:

- Roadway will be asphalt, similar to existing
- Roadway will be 22 feet wide (slightly wider than 20-foot wide existing road) with 2-foot aggregate shoulders and linear ditches on either side.
- Ten-year design life
- Forty-five mph design speed for horizontal curves
- Six percent maximum superelevation
- IDOT design guides and standards will be utilized for design
- Drainage patterns shall match existing; no stormwater detention pond is required
- Other assumptions as referenced in the following sections

2.3 DESIGN

2.3.1 East 3rd Road Horizontal Alignment

The relocated road layout will begin at a connection point just north of the existing ICC property located west of existing East 3rd Road. The connection will be made to the existing asphalt with a butt joint and the road will use a reverse curve that turns west, then north, to create an alignment west of the existing location. A tangent section will be included between the two curves.

The IDOT Bureau of Design and Environment Manual, effective date February 23, 2016, Chapter 32, Horizontal Alignment, was utilized for design guidance of the reverse curve. The reverse curves will be subject to a minimum turning radius that is dependent on design speed and subject to superelevation requirements. Note: superelevation is considered in the proposed conceptual roadway horizontal alignment; however, superelevation final design is not included.

Utilizing a 45 mph design speed, and maximum superelevation of 6.0%, Figure 32-3.C, provided in Attachment 1, indicates a minimum radius of 643 feet should be used. A radius of 750 feet was chosen for use in the concept plan. In order to transition from a typical crowned pavement section (existing) to a superelevated roadway section, a transition length of roadway must be used at both connection points of the roadway. The transition length is comprised of both a superelevation runoff and tangent runout length. The description of these terms and associated equations is provided in section 32-3.02 (included in Attachment 1). Based on an 11-foot wide road, a 1.5% existing crowned cross-slope, and 6.0% superelevation, the transition length should be approximately 163 feet. Based on this, a 175-foot transition length was chosen and is shown on the concept plan. A tangent section of roadway is also required between reverse curves in order to rotate the superelevation from one direction to the other. Based on the tangent length equation

32-3.7 (included in Attachment 1), using the various roadway assumptions aforementioned, the tangent length would be approximately 375 feet; however, for rural areas, a minimum distance of 500 feet is required. A transition length of 500 feet is used in the concept plan.

Figures illustrating the general superelevation development process, Figures 32-3.I, J, K, L, and M, are included in Attachment 1 for reference. Final roadway alignment, transition lengths, and superelevation will be verified and finalized during final design.

2.3.2 East 3rd Road Cross-Section

The IDOT Bureau of Design and Environment Manual, Chapter 54, Pavement Design, Section 54-5.02, Structural Design of Flexible Pavements, Modified AASHTO, was utilized for design on the road cross-section. Based on the Modified AASHTO method and the following assumptions:

- Ten-year design life.
- Seven hundred fifty vehicle average daily traffic (assumed based on Chamlin Report average daily traffic of 715) which equates to a Class IV road per Bureau of Design and Environment, Chapter 54 Class IV Roads and Streets definition.
- Traffic distribution of:
 - Seventy-five percent passenger vehicle
 - Ten percent single-axle vehicle
 - Fifteen percent multi-axle vehicle.
- Traffic factor of 0.007 based on equation 54-5.3.
- Silty clay sub-grade soils equating to an Illinois Bearing Ratio value of 3.

The required flexible pavement structural number (SN) is approximately 2.00. American Association of State Highway and Transportation Officials' modified method uses Equation 54-5.4, $S_N = a_1D_1 + a_2D_2 + a_3D_3$, where a_1 , a_2 , and a_3 refer to the coefficients of relative strength of the surface, base, and subbase, and D_1 , D_2 , and D_3 refer to the thickness of each layer, in inches, to determine the S_N provided for the proposed pavement. Utilizing recommendations from the City for a cross-section, the following was chosen for a new pavement section:

- Surface course thickness – 1.5 inches
- Binder course thickness – 2.0 inches
- Aggregate base course thickness – 9.0 inches

And using the following coefficients of relative strength from Figure 54-5.O:

- A1 (surface course) – 0.40

- A2 (binder course) – 0.33
- A3 (aggregate base course, assume crushed Type B) – 0.13

The proposed SN is 2.43, which exceeds the SN required.

The aforementioned sections of Chapter 54 of this Basis of Design for reference are provided as Attachment 2.

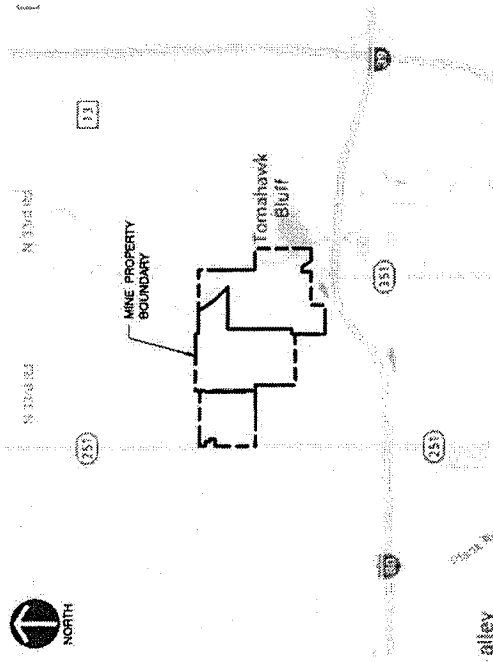
2.3.3 Other

Other roadway design and permitting elements such as signage, intersection design, drainage design, ROW acquisition, City coordination, and public hearing/negotiations, are not discussed in further detail in this report, but will need to be addressed during final design.

ILLINOIS CEMENT COMPANY

DIMMICK MINE
EAST 3RD ROAD RELOCATION

CONCEPT PLAN
NOVEMBER 20, 2017



VICINITY MAP
SCALE: 1" = 4000'

OWNER/TEAM INFORMATION

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WORK ITEM SUMMARY

| WORK ITEM | DESCRIPTION | QTY | UNITS |
|-----------|-----------------------|--------|-------|
| 1.001 | East 3rd Road Removal | 12,856 | SY |
| 1.002 | N 31st Road Removal | 4,115 | SY |
| 1.003 | Trussall Structure | 11,444 | CV |



SITE MAP
SCALE: 1" = 1000'

LOCATION: NORTH OF N 31ST ROAD
SECTION 27, TOWNSHIP 34N, RANGE 1E
SOUTH OF N 31ST ROAD
SECTION 34, TOWNSHIP 34N, RANGE 1E