

PROJECT PROFILE

- Project:** Interior Floor Raising – Frontier Airlines Center, Milwaukee, WI
- Contractor:** CRC Concrete Raising Corp of Wisconsin
- Classification:** Commercial Floor
- Project Scope:** Core drilling and Grouting of 38,016 square feet of interior floor; After pre-scan of floor for buried conduit and junction boxes, determination of injection hole placement (by CRC) and subsequent carpet cutting; Prior to carpet re-gluing
- Project Completion:** October, 2012 – 5 workdays to complete

CRC Concrete Raising Corp of Wisconsin was contracted to raise and stabilize (void fill) all four (4) primary ballroom areas and the East corridor hallway of the Frontier Airlines Center, in downtown Milwaukee, Wisconsin.

Third-party architectural and engineering repair assessments determined that the interior floor areas exhibited a significant amount of settlement, attributable mainly to the consolidation of soils as a likely result of a previous sewer contractor dewatering the soils within the tunnels found beneath the slab-on-grade construction. It was further determined, that unless the unstable floor areas were raised and/or stabilized using a methodology that would consolidate the soils beneath, while setting without shrinking, no assurance could be given that additional settlement would not continue to be realized (potentially resulting in complete concrete floor replacement, and thus loss of facility use for an extended period of time).



Above: CRC crews work to core drill strategically-placed grouting injection holes within the main ballroom areas of the Frontier Airlines Center. Plastic sheeting appears over the carpeted ballroom floor. Flaps were cut in the carpet for grout injection holes.

Prior to the core drilling of the grout injection holes, all ballroom partitions were opened, creating one main work area. A scan was conducted to locate all wiring and communications conduit, as well as any junction boxes to determine exact conduit locations located within/beneath the slab-on-grade interior floor. Plastic sheeting was placed atop the carpeting, which had tape marks placed throughout, to provide visual reassurance as to where carpet flaps should be cut and grout injection holes to be placed.



Above: CRC crews core drill strategically-placed grouting injection holes within the main ballroom areas.

Concrete Raising Corp (CRC) of Wisconsin was selected as the preferred grouting contractor due to CRC's ability to meet stringent time constraints (the ballroom needed to be re-opened for scheduled events within a six (6) calendar day timeframe) and do so while having the capacity to provide a consistent, calibrated cement grout material, specified to have three hundred and twenty-nine (329) pounds of cement per cubic yard of material injected.

Initial core drilling took place over the course of the first full day and saw no less than four (4) core drills, each equipped with vacuum hoses to reduce dust particulates, operating within the work area at one time. The structural integrity of the floor itself was sound, and floor thickness was generally found to be in the range of twelve-and-one-half to fourteen (12.5-14) inches, as verified by the actual cores removed.

It was determined, based upon an average combined raise/hollow of approximately two (2) inches, the Frontier Airlines Center would require up to two hundred and thirty (230) cubic yards of material to raise the settled portions of the floor and stabilize the remaining areas indicated.

Upon core drilling, and gaining access to the voids, the voids discovered ranged from one-and-one-eighth of an inch to one-and-seven-eighths of an inch, coupled with the settlement areas that varied up to two-and-one-half to three inches.



Above: A 14-inch core taken from the interior floor of the Frontier Airlines Center.

CRC's volumetric mobile mixers were calibrated to produce the specified 329-lb/yd³ cement grout (see picture, next page). Volumetric mixers are designed to produce material on-site and on-demand, to ensure fresh, consistent, calibrated material for each and every job. Such mixers are capable of producing sixty (60) cubic yards of material per hour.



Above: A 3-ft by 3-ft by 3-ft (1 cubic yard) sample of the specified cement grout. As standard protocol, contractors are often asked to demonstrate calibrated settings. Note the completeness of the void fill and consistent nature of the grout produced by CRC's volumetric mixers.

Beginning on Day 2, in order to meet the unique demands of the job, CRC mobilized two (2) different style pumps: a single-piston "mud pump", modified to run off of propane to allow for interior work without concern for indoor air quality and/or ventilation of pump exhaust, and a larger concrete pump (rated at 60 cubic yards of material per hour) to accommodate void filling in a time-efficient manner through hoses extending in excess of three hundred and fifty (350) feet in length.



Above: A CRC volumetric mixer is shown producing fresh grout at the Frontier Airlines Center. The grout was being mixed into a 60-yard concrete pump (shown at the back of the work truck) and pumped to the interior ballroom, where the line was reduced and the material injected.

Right: A CRC single-piston pump, with a propane conversion apparatus is used to inject grout inside the Frontier Airlines Center in early October, 2012.



Injection grouting continued throughout the course of day 2, while additional core drilling prepared the remaining ballroom areas for grouting on subsequent days. Laser transits were set within the jobsite to monitor raise/lift of the interior floor, to ensure that the prescribed tolerance level of "up to one-quarter (1/4) inch" was met with a measured degree of confidence by all parties involved (Note that CRC's final tolerance levels far exceeded engineer expectations).

Additional core drilling took place again on Day 3, as CRC had finished injection grouting the East Hallway Corridor, as well as Ballrooms A and B the day previous. During drilling operations, CRC personnel began patching the completed injection holes with prescribed patching material (sand-cement mix) and plastic sheeting was removed from the grouted areas, so that carpeting professionals could begin re-gluing the carpet flaps down (shown in pictures, at right).



Prior to any grouting operations, it should be noted that CRC made special accommodations to make certain that the metal hose clamp connection areas would not damage the carpeted areas. “Such foresight is directly attributable to a company with over 65 years of experience within the industry,” said a member of the Frontier Airlines Center team.



On Days 4 and 5, core drilling was completed and Ballrooms C and D, plastic sheeting was removed, holes patched, and carpet flaps re-glued to their original position.



In all, just shy of 230 cubic yards of calibrated cement grout was injected within a period of two-and-one-half (2.5) actual grouting days. The Frontier Airlines Center reopened for meetings and conventions on Monday, October 8.

CRC started work on Monday, October 1, and completed operations (inclusive of all carpet flaps being re-glued) mid-afternoon on Friday, October 5 (ahead of schedule).



Above: (Left) A picture showing the settlement of the carpeted floor at the Frontier Airlines Center just prior to raising by way of calibrated cement grout. (Right) A picture taken immediately following the grouting process performed by CRC Concrete Raising – note that the wall no longer has a one-and five-eighths (1 5/8) inch “gap” at the base.

About CRC Concrete Raising:

CRC Concrete Raising Corp, through proprietary improvements to technology and use of the latest, state-of-the-art equipment (including but not limited to the volumetric mobile mixers shown below), is dedicated to providing the finest slabraising and cement grouting service in America.

With locations throughout the United States, providing services to the residential, commercial, industrial, municipal, and numerous government agencies, CRC has the equipment and capability to perform jobs other industry companies cannot.

For larger jobs with tight time constraints, CRC has the resources to pull additional manpower, volumetric mixers, subsequent pumping equipment, and ancillary apparatuses (as required) to accommodate unique grouting operations.



Why replace concrete that is structurally sound, when you can raise it with CRC? Raising benefits include (but are not limited to): Cost (generally a fraction of the cost to replace); Immediate access; Material and workmanship warranties; Quality (calibrated, metered materials); Knowledge and experience (65+ years); Environmentally-friendly alternative to replacement; and, Little ancillary costs (no re-landscaping).
