
MEMORANDUM

TO: BOARDS OF SUPERVISORS OF NON-FEDERAL LEVEE DISTRICTS

FROM: Joseph B. Gibbs, PE

SUBJECT: INSPECTION OF PIPES and LEVEE SYSTEMS LOWER THAN 100 YEAR FLOOD EVENT
(1 PERCENT CHANCE OF FLOODING)

EFFECTIVE DATE: 2/03/2020

----- The following (A thru F), as amended, has been confirmed as correct and accurate as the result of a phone call that I made to Mr. Jud Kneuvean [(816) 389- 3281] of the US Army Corps of Engineers (USACE), Kansas City District Emergency Management Branch on March 15 and 16, 2010, in response to an e-mail that I sent to him on March 3, 2010 and receipt of a letter from him dated May 12, 2010, in regards to a letter I addressed to him February 26, 2010; and, as the result of an e-mail message I received from Mr. Kneuvean on April 8, 2015.

----- As to certification of a non-federal levee system, for a district where the levee system is lower than a 100 year flood event (less than 1 percent chance of flooding); and, where such a levee system will remain at this level of flood protection:

A) The levee embankment and appurtenances will NOT have to be inspected for "certification" by an Engineer at the district's cost, nor will they be inspected for "certification".

B) The levee embankment and appurtenances initially will be inspected by the USACE by 2012, at a cost borne by the USACE, and a degree of "acceptability" will be assigned to them. This "initial" inspection will include a linear survey along the length of the levee combined with a cross-section survey of the top width, slopes and buffer area of the embankment and inspection of other facilities and factors to determine if the levee system meets the requirements of USACE standards for eligibility for Title 84-99 flood damage rehabilitation funding.

C) After this "initial" USACE inspection, only "routine" inspections at USACE cost will be conducted (at 1 or 2 year intervals). No "periodic" inspections by the USACE every 5 years are planned at this time.

D) Combined with this USACE "initial" inspection will be the results of internal pipe / culvert inspections. Such pipe inspections will be managed and all paid for by the respective district or sponsor. The Specifications for the internal inspection of the pipes / culverts are: "There are no breaks, holes, cracks in the discharge pipes / culverts that would result in significant water leakage. The pipe shape is still essentially circular. All joints appear to be closed and the soil tight. Corrugated metal pipes, if present, are in good condition with 100 % of the original coating still in place (either polymer, asphalt or galvanized) or have been relined with appropriate material, which is still in good condition. Condition of pipes has been verified using DVD camera inspection methods or an alternative inspection method approved by the USACE within the past five years, and the report for every pipe is available for review by the inspector." (See "LEVEE OWNERS MANUAL FOR NON-FEDERAL FLOOD CONTROL WORKS" dated March 2006, for additional information).

E) Inspection of pipes / culverts will have to be repeated every 5 years at the district's cost and the records of the inspection reports kept for inspection by the USACE. When contracting for video camera inspection of pipe services, the following items need to be addressed.

Video camera inspection equipment is usually transported to the site in a 1 ton dual wheel non-four wheel drive van body type truck which will have a minimum of under carriage clearance with saddle fuel tanks and side mounted electric generators. Such a truck will need ideal ground conditions for traveling to pipe sites and will have difficulty traveling in crop fields and soft areas. It is therefore advised that access be provided to the pipes by having the truck drive on top of cleared and mowed levees. In this case the ground conditions will have to be dry to keep the truck from bogging down. A minimum of 10 feet of levee crown width is recommended to keep the truck's axle from dragging on the levee. With this method of access to the pipes, a truck of this type will remain on top of the levee. From this position, the cable and camera equipment will have to be carried up and down the slope of the levee. A 400 foot camera cable is sufficient for a 20 foot high levee with 3 horizontal to 1 vertical side slopes and a 160 pipe. Always pre-measure these distances for contracting purposes.

Operation of the equipment is quite easy and one travel through the pipe takes less than 20 minutes. The camera will travel through water and sloppy mud; however, when these conditions are encountered, the camera will not produce a visual image of the interior of the pipe in these locations. Even clear water trapped in the pipes prevents the camera from providing an image. High water during 2010 kept flap gates from releasing trapped water in the pipes and the camera equipment had to return to the district several times over 8 months to get all of the pipes inspected. Even with ideal ground conditions, for a district with several pipes the contractor will have to come to the site several days to complete the project.

When river stages permitted release of trapped water through the flaps, sediment had settled and coated the interiors of the pipes. Under these conditions the pipes had to be "jetted out" to provide a desirable camera image of the interior of the pipe. Wildlife, stones, mud, sticks and other debris were encountered during the 2010 inspections. It is suggested that "jetting" services be a must for contracted camera inspection services and provided on a unit per pipe basis. These services are usually provided from a different truck loaded with sufficient water for several pipes. These are heavy trucks with water tanks and desirable ground conditions apply for them too.

Mapping of the district provided by the District showing the locations of the pipes is necessary for contractual purposes and record keeping. The pipe locations should be indicated on the map by footage numbers from a beginning point along the levee. For District record purposes, DVD camera images must clearly show for each pipe the interior of the pipe, indicate inspection date, pipe location number and footage indicated on the video image along the interior length of the pipe. It is necessary that remotely controlled DVD cameras have multi-directional viewing lens to provide images and details of the interior circumference surfaces of the pipes.

Exterior still photographic images were taken for record keeping purposes of each pipe showing the flaps and the levee at the outlet end and the levee and inlet ends of the pipes. Portable signage was utilized for pipe location on the map with a digital camera that imprinted the date on the photo.

An acceptable alternative method of internal pipe inspection is: 1) With the flap gate open, visually view through to the opposite end of the pipe. Daylight shining in from the opposite end of the pipe must indicate a full circular shape with no standing water or deformed or out of round sections along the full length of the pipe. 2) A still camera photo of the interior of the pipe shall be taken at each end of the pipe with the date indicated on the photos. At a minimum, these photos shall show the interior condition of the lower 1/2 circumference of the pipe for the first 9 to 10 feet of the pipe. 3) Additional still photos shall be taken to

indicate the exterior condition of the pipe. These photos shall be taken at each open end of the pipe with the date indicated, showing the condition of the pipe and its appurtenances; and, with some type of signage, shall indicate the site of the pipe in the levee system, e.g. Sta. 1+00, etc. 4) A visual inspection and written statement shall be made for each pipe along the alignment of the pipe over the surface of the levee embankment to locate any settlement or depressions. Such reports can be augmented with photographs. The cause of such depressions and settlement shall be determined. 5) The photos and written reports of this method of pipe inspection shall be kept in the permanent records of District.

For pipes large enough for personnel entry, still cameras that imprint the date on photos can be utilized. The mapping, interior pipe conditions and the requirements of what the photos must show are the same as those for DVD camera images in the smaller pipes. The flash of a camera is generally effective for approximately 9 feet. Several photos will be needed to photograph the interior conditions of long pipes. Signage imprinted in each photo or an alternative record keeping method indicating location along the interior of the pipe will be necessary. A measuring tape of sufficient length and sufficient signage to reach the end of each pipe will be necessary.

F) Past records of maintenance and operation do not need to be organized in the new record keeping system but only need to be made available. The format for future records systems will have to meet USACE requirements.

----- I am advising that districts do the following to begin repairs and budgeting for future potential expenses to keep the district active in the Title 84-99 program.

- 1) Proceed with establishing a 15 foot minimum cleared and maintained buffer area beyond the base of both sides of the levee embankment and establish woody free acceptable vegetative cover on the embankment and 15 foot buffer areas.
- 2) Placing rip-rap or erosion control at the discharge end of drain pipes.
- 3) Proceed with the DVD camera or a visual inspection method of choice of drain pipes and make repairs to them and appurtenances as needed. With pre-approval of the USACE, alternative methods of pipe inspection may be utilized. For water control structures continually flooded by water, acceptable professionally certified inspections may be able to be provided by written reports and photography.
- 4) Measure the length of sections of levee embankments that are potentially too close to creek and river banks and compute estimated costs to realign them land side as the result of the USACE report.
- 5) Start locating past records of maintenance and repairs, and start a record keeping system of maintenance, repairs and pipe inspections to make the records manageable in a form acceptable to the USACE.
- 6) Proceed with moving any drainage ditches 15.0 feet away from the base of the levee embankment.
- 7) Proceed with the replacement of drain pipes and flap gates that are in bad condition. The minimum specifications for replacement piping is riveted 12 gauge corrugated metal polymer coated pipe. I recommend that drain pipes have an antiseep collar placed 5 feet landside of the landside edge of the crown of the levee. Additionally, of the same material, all couplings should be 24 in long bands with 2 rod and lug fastenings per pipe (4 total required).

---- This information, notices and recommendations are offered only as of the effective date of this MEMO and the information, requirements, Specifications and recommendations can change without notice.