

Minneapolis Energy Center

Distribution vaults rehabilitation program

Presented at IDEA's Thermal Distribution Workshop New Orleans, February 26, 2019



In Downtown area, Minneapolis **Energy Center** maintains more than 160 steam and chilled water distribution vaults built at different times and under different design conditions longevity and reliability of the vaults is essential for the system operation.



MEC's current design criteria were adapted from AASHTO Load Rating standard





ORIGINAL PIPE SLEEVES WERE MADE OF EITHER GALVANIZED OR EPOXY COATED BLACK STEEL AND FAILED DUE TO CORROSION RELATIVELY QUICKLY, CAUSING A LOSS OF PROPER SEAL OF THE WALL PENETRATIONS.

SEVERAL YEARS OF TESTING HAD PROVEN THAT 'LINK-SEAL' ON VAULT WALL PENETRATIONS OF PLAIN REINFORCED CONCRETE WITH UP TO 3" OF COVER REQUIRES NO ADDITIONAL SLEEVE TO CREATE A PERMANENT HYDROSTATIC SEAL. SHOTCRETE OR ANY OTHER PATCHING TECHNIC PROVIDES ONLY TEMPORARY SOLUTION AND CANNOT RESTORE LOAD BEARING CAPACITY OF THE REPAIRED STRUCTURE.

INJECTION OF EPOXY MAY HELP TO STABILIZE CONCRETE BUT DOES NOT STOP CORROSION ON 'INFECTED' REBARS.

WHEREVER INNER SPACE PERMITS, THE OLD CONCRETE WALL MAY BE USED JUST TO FORM A NEW STRUCTURE INSIDE EXISTING.







CONCRETE DELAMINATION CAUSED BY CORROSION OF REBAR, DUE TO TRAPPED MOISTURE AND SNOW MELTING SALTS, INSUFFICIENT CONCRETE COVER, AND ALTERNATING LOADS.

MEC'S CURRENT DESIGN REQUIRES 12" THICK ENCLOSURE WITH EPOXY COATED REINFORCING STEEL, MIN. OF 2" CONCRETE COVER, AND CHLORIDE-SPECIFIC CORROSION INHIBITOR IN ADMIXTURE.









SAFETY CONCERNS ABOUT PERMANENT LADDERS:

- AGING CONCRETE WEAKENS ANCHOR POINTS
- HARSH ENVIRONMENT PROMOTES CORROSION THAT IS NOT ALWAYS DETECTABLE BEFORE ENTERING THE VAULT (INSPECTION per OSHA § 1910.23(b)(9))
- PORTABLE ALUMINUM OR FRP LADDERS ARE CONSIDERED A SAFER OPTION

IN TIGHT VAULTS STEPPING ON A PIPE DAMAGES THERMAL INSULATION... IN SUCH AREAS, RIGID FOAMGLASS HALF-SHELLS WRAPPED IN FABRIC/MASTIC/ALUMINUM JACKET ARE USED IN LIEU OF STANDARD MINERAL WOOL INSLATION.

Clearway Energy







MANHOLE COVERS OF COMPOSITE MATERIALS ('FIBRELITE', ETC.) ARE LIGHTWEIGHT, WATERTIGHT, TOLERATE ELEVATED TEMPERATURE, AND PROVIDE LOAD BEARING CAPACITY OF 40 TONS.

COMPOSITE MATERIAL COVERS ARE BEING INSTALLED IN ALL AREAS OTHER THAN ROADS WITH HIGH-SPEED TRAFFIC.





Polyurethane foam on old lid was burned off by radiant heat from the steam piping.

LOCAL CONDITIONS AND NEIGHBORING UTILITIES DETERMINED SHALLOW INSTALLATION OF THIS VAULT, NOT ALLOWING FOR CONSTRUCTION OF A TYPICAL LID. 'FIBRELITE' TRENCH COVER PANELS WERE

COVER PANELS WERE USED IN LIEU OF LID/MANHOLE ARRAY.







CAST IRON MANHOLE COVERS APPROVED FOR HIGH-SPEED TRAFFIC APPLICATIONS ARE USED ON ROADSIDE OF THE STREETS. TO PREVENT DIRECT CONTACT BETWEEN ROAD MAINTENANCE SALTS AND REINFORCED **CONCRETE STRUCTURES, MEC-PROPRIETARY GUTTER/CAP** SYSTEM COLLECTS LEAKS AND **DIVERTS THEM TO THE BOTTOM OF THE VAULT; IT ALSO REDUCES HEATING OF THE CASTING AS A MATTER OF PUBLIC SAFETY.**



MEC-PROPRIETARY CONTINUOUS PASSIVE AIR VENTILATION SYSTEM STABILIZES AMBIENT **TEMPERATURE AND** LOWERS HUMIDITY IN **DISTRIBUTION VAULTS. DRY PITS LOCATED OUTSIDE THE VAULT BELOW THE LOWEST** PENETRATION **PREVENT FLOODING** THE VAULT.



IN SOME PARTICULAR CASES WHERE TRENCH EXCAVATION IS NOT PERMITTED, SUCH AS RAILROAD CROSSINGS, ETC., DIRECTIONAL BORING COULD BE A FEASIBLE ALTERNATIVE.

DIRECTIONAL BORING TYPICALLY SET UP 12' TO 15' BELOW GRADE, ALLOWS AVOIDING CONFLICT WITH OTHER UTILITIES AND MINIMIZES IMPACT OF STRAY CURRENTS. THIS IS EXPENSIVE OPTION, STEAM VAULTS ON BOTH SIDES OF THE "TUNNEL" ARE OFTEN **NEEDED TO CHANGE STEAM PIPE ELEVATION.**

35" FLOAT STEAM TRUP TLV MODEL JH

T.

RAWANCO INSUL 800

4" SIDEDULE 40

100 PSI STEAM FLOW

PPING INSULATION

AND JACKET

ANCHOR PLATE

- SYSTEM

BALL FLOAF

CONDENSATE RETURN XHXH

GRADE

FARRY ATER

DOUBLE -

PIPE SECTION - ELEVATION

THERMO. AH

VENT

CONDENSING CHAMSE'TE

OTHER ISSUES AND CHALLENGES:

 CONCRETE PERFORMANCE SPECIFICATION. COATING INTERNAL SURFACES OF CONCRETE VAULTS. SIKABIT S-60 or TAMKO TW-60 (self adhering) waterproofing membranes). •SIKA ARMATEC 110 (bonding agent). CRETEX MANHOLE LEAD SEAL. 4" STEAM MADE BY RAMANCO BISLE BOD IN-PIPE STEAM TRAP DESIGN. OTHERS --SYSTEM CONCENSATE RETURN 4" SCHEOULE 40 SCHED 80 STL OTHERS FABRICATED ELROW SECTION •NEW DESIGN FOR VAULT CHE ROWINCO **ACCESS SHAFT MINIMIZING** SEAL WELD PIPE PENETRACIONS ANCHOR PLATE CONDENSATE RETURN **TRAFFIC LOAD TRANSFER** SCHED. 80 STL. INSIDE 4" SCHED. 40 STL STEAM MAIN 4.10 WHERE INSEE . INCOME SYSTEM A" SCHEDULE 40 TO THE VAULT'S LID. 4"x6" ECCENTIC TYPES OF STEAM TRAPS AND REDUCER 4"x6" EDCENTRE: REDUCER FOR **TRAP ARRAY (single or double).** •FRP PIPING FOR CONDENSATE. 6" X HEND 1/2" COND. RETURN LIGHD COLLECTION AREA WELDED TO INSIDE BOTTOM OF ELEON



OUESTIONS?