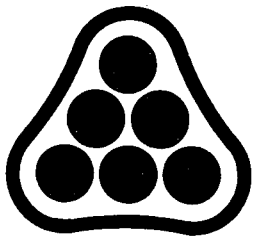

PROFESSIONAL
ENGINEERING
CONSULTANTS
PROFESSIONAL ASSOCIATION

FINAL DRAINAGE REPORT

FOR

ST. FRANCIS REGIONAL MEDICAL CENTER

PROPOSED "P" BUILDING

PREPARED BY

PROFESSIONAL ENGINEERING CONSULTANTS, P.A.

ENGINEERS

WICHITA, KANSAS

MARCH 22, 1990

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I. SCOPE OF PURPOSE OF STUDY

This report presents the findings of a study of the proposed P Building expansion of St. Francis Regional Medical Center in Wichita, Kansas. The proposed building site lies across North St. Francis Avenue in the south portion of the 900 block. The new building will disrupt current drainage patterns. This report addresses what is to be done to convey drainage from the site.

Detailed analysis in this report is limited to the immediate 6.8 acre drainage basin at the site. Only general review of off-site conditions were made.

II. CURRENT DRAINAGE PATTERNS

Drainage in the area is currently conveyed in a very small capacity storm water sewer system. One 12-inch lateral serves the inner courtyard area of the hospital campus; a 15-inch line lies in St. Francis Avenue and carries both surface runoff and roof drainage. These lines meet near the northwest corner of the proposed P Building. The outfall to this system is a 36" x 42" brick arch storm sewer dated from the 19th century lying in Murdock Street. This line runs east nearly a mile to the Wichita Drainage Canal. Numerous studies over the years have identified this system as being extremely undersized for the current land uses in the basin.

During major storms, the storm water sewers have inadequate capacity and the conveyance of the majority of the water is on the street surface. For the basin in question, water flows from the intersection of Ninth and Santa Fe west to St. Francis and thence south to Murdock. The proposed building site will obstruct this overland flow, and thus the street flow as well as the storm sewer flows must be redirected.

III. HYDROLOGIC ANALYSIS

The basin is defined as shown on the enclosed figure and is 6.8 acres. Although roof drains for the building on Emporia Avenue and for the proposed P Building do not discharge into this basin, it is assumed that under conditions of a major storm, the roof drains will become overtaxed and emergency overflow through the parapet will occur; thus the basin area incorporates approximately half of the roof area of these building.

The discharge rates and volumes have been computed using the method set forth in Technical Release No. 55, "Urban Hydrology for Small Watersheds", Soil Conservation Service, U.S. Department of Agriculture, 2nd Edition. Assumptions in modeling the watershed are 100% impervious area, yielding a runoff curve number of 98 and a time of concentration of six minutes or 0.1 hour. Due to the extent of roof and pavement areas and the use of roof and storm drain systems for at least the minor storms, these assumptions are felt

to be the most conservative. Please note that the soil types and antecendent moisture condition are irrelevant under 100% impervious conditions. Analysis was made for the 24-hour storm for several return period storms.

Based on the analysis outlined above, the results are summarized below:

TABLE 1: DESIGN RUNOFF VALUES

	Exceedence Probability, Percentage					
	50	20	10	4	2	1
24-hour Rainfall Depth, Inches	3.5	4.5	5.3	6.1	7.0	7.8
24-hour Runoff Depth, Inches	3.3	4.3	5.1	5.9	6.8	7.6
Peak Runoff Rate, Cu. Ft./Sec.	36	46	55	63	73	82
Runoff Volume, Acre-Inches	22.4	29.2	34.7	40.1	46.2	51.7
Runoff Volume, Million Gallons	0.61	0.79	0.94	1.09	1.25	1.40
Recurrence Interval, Years	2	5	10	25	50	100

IV. PROPOSED DESIGN CONCEPTS

As stated previously, the proposed construction will obstruct surface drainage which currently flows south along St. Francis Avenue Several options were considered to deal with this flow as outlined below:

1. Maintenance of Street Flow. This alternate would require redesign of a portion of the building to keep the street surface open for drainage. A second floor connection would pose no problems from a drainage standpoint, and would preserve current drainage patterns. A big disadvantage is the compromise of building function required to accommodate this concept.

2. Slot Through Building. This concept would require special architectural and structural considerations. The height of opening would be limited to approximately 1 foot to prevent flooding of adjacent window wells. Construction, maintenance and cleaning of this opening would be very difficult. However, existing drainage patterns could be preserved.

3. Flume. This option would consist of drainage by gravity to Santa Fe Avenue through a flume approximately 500 feet long with only 0.10% slope. Obtaining this flat slope during construction would be nearly impossible. The width of flume required would be 40 to 50 feet. Construction of the flume would preclude interconnection of all buildings.

4. Storm Sewer. The existing storm sewer will be required to be kept in service since it drains some of the roofs of surrounding building. Construction of any new conduits to convey major storms is impractical as they would connect to the existing inadequate piping

systems. Due to the large volume of runoff from a major storm, water would backup through the storm sewer system, and possibly cause flooding of the building. This option might be practical if the City of Wichita initiated a new major outfall line discharging directly to either the Little or Big Arkansas River. However, no plans for such a system are under consideration in the near future.

5. Total Flow Pump System. This option consists of construction of a wet well and pumping the discharge to a point off site. The nearest discharge point would be on a street surface, say along Santa Fe Avenue. An alternative would be to construct a force main and discharge directly to the Little Arkansas River.

   Problems inherent in this option are the size of pumping units required to discharge at the peak flow rate for a 100-year storm; the introduction of flood waters on the street surface at a concentrated point; the lack of alternative flow routes in case of exceedence of the design storm.

6. Storage and Low Rate Pumping System. This option consists of collecting runoff by gravity into a holding tank, and then pumping at fairly low rates to an off-site discharge point. The storage required is quite large; but its cost can be offset by the great reduction in pumping unit capacity over option 5.

Consideration of the above six options was made in consultation with hospital staff and the project architect. The sixth option was chosen as the overall best option based on desired building location and function, architectural considerations, and estimated life cycle costs.

V. DESIGN COMPONENTS

Preliminary design of the system has been completed. The following components have been identified:

1. Collection of runoff in St. Francis Avenue via trench drains across the width of the street at two collection points. These inlets will be designed to work in tandem in case debris clogs portion(s) of the inlet(s). Appropriate safety factors for free-opening area will be used to accommodate the potential for clogging. Reconstruction of the street is required to construct the two new sump locations.

2. Conveyance of runoff via a reinforced concrete box culvert from St. Francis Avenue to a detention basin in the proposed P Building Parking Garage.

3. Provision of a detention basin in the parking lot basement. We recommend that this be sized to fully store the 100-year design storm without pumping. As shown in Table 1, this requires a volume of 1.4 million gallons. The storage volume should be provided below the flow line of the inflow storm sewer. The basin should also have an overflow opening which can discharge water to the street surface on Santa Fe Avenue under extreme conditions.

4. Installation of a pumping plant in the detention basin with a force main connected to the storm sewer in Santa Fe Avenue. This pumping plant should consist of two or more pumps which may be cycled on and off based on stage, running time, and/or inflow volume. The pumping plant should be sized to discharge the entire storage volume in a 24-hour period. Maximum discharge rates should be approximately 1,000 gallons per minutes so as not to overtax the receiving storm sewer system. Maximum discharge head to pump against in the force main is controlled by street flooding in Santa Fe Avenue and is estimated to be elevation 115.0.

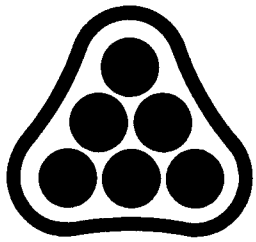
5. Collection of the courtyard storm sewer system and rerouting this system to the north.

6. Retention of the existing storm sewer in St. Francis Avenue and its connection to the trench drain system.

7. Reconstruction of the intersection of Ninth and St. Francis to direct drainage to the north and away from the P Building area. This will provide some diversion of extraneous flow from other basins during major storm events. However, in an extreme occurrence where significant street flooding occurs, water may break over crests to adjacent basins and make its way to the P Building site. Without a complete topographic survey of a large portion of the neighborhood, no conclusive analysis can be made as to the potential of such an occurrence.

VI. SUMMARY

An underground detention storage system is proposed to accommodate drainage in the P Building drainage area, with a low discharge pumping plant. Runoff is to be collected by means of trench inlets and a box culvert storm sewer system. The proposed system is designed to accommodate the 100-year, 24-hour storm from the 6.8 acre basin. No attempt has been made to determine a precise volume of runoff which may contribute to the area as extraneous flow from adjacent basins during extreme runoff events.



PROFESSIONAL
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June 4, 1990

Mr. Michael E. Lindebak, P.E.
City Engineer
City Hall - 7th Floor
455 N. Main
Wichita, KS 67202

Attention: Ms. Vicky Huang, P.E.

Reference: St. Francis Regional Medical Center
"P" Building Addition Street & Drainage Improvements
PEC File No. 32-90210-299

Dear Mr. Lindebak:

Transmitted herewith is one set of Office Check plans for the referenced project as well as two copies of an engineering report entitled "Final Drainage Report". As you are aware, St. Francis has embarked on a large expansion program of their existing facilities. The major feature of this expansion program is an addition to the existing South Tower. This addition will be constructed across the former St. Francis Avenue right-of-way, which now is a private street and Drainage Easement. To accommodate the surface drainage, the following design features have been incorporated into the project.

a) St. Francis Avenue will be reconstructed to locate two sumps for drainage collection.

b) Runoff will be conveyed from the street via a 2-6'x3' reinforced concrete box storm water sewer to a detention basin.

c) A 1.4 million gallon detention basin has been incorporated beneath the proposed parking garage.

d) Three submersible pumps will discharge the collected storm water at a rate of 1000 gpm (2.2 cfs) via a force main to the public system in Santa Fe Avenue.

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Our purpose in presenting these plans for your review are threefold:

1) To allow staff review and comment regarding the drainage concept and plan details prior to submittal of the plans to the Central Inspection Division. We wish to incorporate any of your revisions and comments prior to their review, and would ask that your endorsement be affixed to the plans upon approval.

2) To allow staff review and comment on the drainage concept prior to application for a Vacation of the existing Drainage Easement along St. Francis Avenue.

3) To allow staff review and comment regarding the plan details of the connection of this private storm water sewer to the public storm water sewer in Santa Fe Avenue.

The Directors and Staff of St. Francis are desirous of commencing construction this summer. Howard, Needles, Tammen and Bergendoff, the Architect, is scheduled to being printing final plans very soon. Review and comment on these plans within the week would be greatly appreciated. We are available to meet with you at your convenience to go over any plan details and to answer your questions.

Very truly yours,

PROFESSIONAL ENGINEERING CONSULTANTS, P.A.

Michael W Berry

Michael W. Berry, P.E.
Project Engineer

MWB/cas

Encl. As noted

xc: Dan Pace, SFRMC
Andy Anderson, HNTB
Keith Taylor, HNTB
File thru RDP, GDS

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PROFESSIONAL ASSOCIATION

June 13, 1990

Keith R. Taylor, A.I.A.
Senior Project Architect
Howard, Needles, Tammen and Bergendoff
P.O. Box 419299
Kansas City, MO 64141-9299

Reference: St. Francis Regional Medical Center "P: Building Addition
HNTB Project No. 07072-89-10
PEC File No. 32-90210-299

Dear Mr. Taylor:

Transmitted herewith are the final reproducible drawings for St. Francis Avenue street and storm sewer improvements for the referenced project.

These are being transmitted for your use in producing large format standard project drawings. There are 24 sheets numbered C7 through C30.

The Engineering Division of the Department of Public Work plan review was conducted by Ms. Vicky Huang and has been completed. Their comments included the following:

1. The City requests that the drainage and utility easement in former St. Francis Avenue right-of-way be vacated as much as practicable. The drainage easement should be vacated in its entirety; the utility easement should be narrowed to cover an appropriate area adjacent to the City's waterline. I advised Ms. Huang that this will be undertaken in the vacation case before the appropriate governing body.

2. The existing 15-inch RCP storm sewer should be removed to the south limit of the proposed building construction. I advised Ms. Huang that this is covered in the demolition drawings developed by HNTB.

3. The Central Inspection Division shall inspect all storm water sewer conduits 12-inch in diameter and smaller. The Public Works Department will not conduct any inspection. The advises the Owner to engage qualified inspection personnel for those portions of the storm water sewer system which are large size conduits and will not be inspected by the City.

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With these comments, Ms. Huang has endorsed Sheet No. C7 with her approval.

Please return these original drawings after they have been reformatted onto your standard drawing sheets. If there are any questions, please advise.

Very truly yours,

PROFESSIONAL ENGINEERING CONSULTANTS, P.A.

Michael W. Berry

Michael W. Berry, P.E.
Project Engineer

MWB:epl

Enc: As noted

xc: Dan Pace
Vicky Huang
File through RDP, GDS, KLR