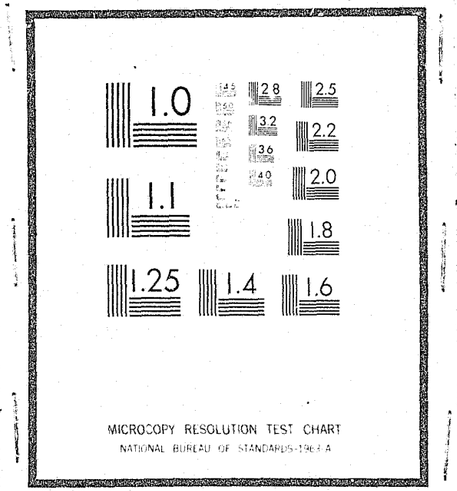

R-76-190

LAW ENFORCEMENT ASSISTANCE ADMINISTRATION
POLICE TECHNICAL ASSISTANCE REPORT

SUBJECT: Concord, New Hampshire; Evaluation of a CCTV Security System

REPORT NUMBER: 76-179

FOR: Concord, New Hampshire, Police Department
City Population: 33,000
Police Strength (Sworn): 55
City Area: 64 square miles

CONTRACTOR: Westinghouse Justice Institute

CONSULTANT: Gene A. Buzzi

CONTRACT NUMBER: J-LEAA-003-76

DATE: October 1976

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FOREWORD

This request for technical assistance was made by the Concord, New Hampshire, Police Department. The requested assistance was concerned with determining whether the CCTV system, implemented recently by the Department, complied with the specifications document that was used in the bidding process.

Requesting Agency:	Concord Police Department, Chief of Police David G. Walchak
State Planning Agency:	Governor's Commission on Crime and Delinquency, Mr. R. J. Curran, Deputy Director
Approving Agency:	LEAA Region I (Boston), Mr. John M. Keeley, Police Specialist

1. INTRODUCTION

The City of Concord, New Hampshire, hereinafter called the purchaser, made public a "Request for Bids" (RFB) for a Closed Circuit Television System (CCTV) to be used by the City's Police Department for surveillance of the Police Station in Concord. The specifications document used in the bidding process, to describe the required system, was formulated by the Police Department aided by a vendor familiar with CCTV systems.

Award of the CCTV contract apparently was made on the basis of low, responsive bid only. Award was made by the City's Purchasing Department with little consultation on the part of the Police Department.

The award of the contract to the lowest bidder was challenged by several other vendors who bid on the system. Because of this, the City requested that the awardee submit to the City, in writing, a statement indicating that the proposed equipment met or exceeded the requirements of the specifications used in the bidding process. The awardee complied with this request, with no further evaluation of his proposal performed.

Following the installation of the CCTV system by the awardee, hereinafter called the vendor, an inspection of the system was made by Mr. James M. Moran, Planning and Evaluation Office, Concord Police Department, and Mr. F. James Connor, State Police Communications Technician. Mr. Connor, in a letter to Chief Walchak, identified several areas where the vendor failed to meet or exceed the requirements of the specifications. Chief Walchak, in turn, transferred responsibility for resolution of the matter to City Purchasing. The vendor was then given the opportunity to correct the areas of noncompliance.

Following the return of the vendor to the project site and his ensuing rework of the system, the City of Concord deemed it necessary that the CCTV system be evaluated to ensure compliance with the specifications. Since expertise in the field of CCTV was not readily available to the City, a request was made to LEAA for necessary technical assistance so that a timely completion of this project could be realized.

The Consultant made a site visit to Concord, New Hampshire, to confer with the Police Department officials and evaluate system performance. Following a preliminary tour of the complete system, the Consultant and Mr. Moran discussed the project's case history, which paved the way for the first phase of the evaluation process. Discussed in detail were:

- System concept and the technical requirements delineated by the specifications document.

- Bidding process.
- Failure of vendor to supply specified equipment and subsequent correction of deficiencies.

The second phase of evaluation included a comprehensive inspection of all equipment comprising the CCTV system together with an operational test of the same.

Persons interviewed included:

- Chief of Police David G. Walchak.
- Mr. James M. Moran, Planning and Evaluation Officer.

2. UNDERSTANDING OF THE PROBLEM

The problem, as originally stated in the task request, was "to determine whether or not the existing CCTV equipment meets the specifications and can do the job." The Consultant did not find it necessary to deviate from the intent of the original task.

3. ANALYSIS OF THE PROBLEM

Analysis of the problem included the two phases of an evaluation process outlined previously in Section 1. Investigation was made into each area of interest contained within the scope of the "project case history" and the "comprehensive inspection of equipment."

3.1 Evaluation -- Phase I

3.1.1 System Concept

The CCTV system, as specified by the purchaser, was to provide the Concord Police Department with the ability to continuously monitor activity in key locations within the Police Station. Visual monitoring was to be accomplished via "compact" video cameras located in each of the four detention Cell Block Areas, Cell Block Main Corridor, Public Entrance, Station Garage, Entrance from Garage to Station, and Rear Entrance to Garage. In addition, visual and aural surveillance would be maintained for the Prisoner Receiving Area (Booking Area), as well as the ability to record the video and audio portions of all booking activities. The actual monitoring process would be performed at the Station's Communications Center. Here, the radio dispatcher would view two video monitors each of which show, in sequence, the video output of eight cameras. A third video monitor would be used for continuous monitoring of any one of the 16 cameras in the system as selected by the dispatcher (spot-monitor feature). Camera switching would be performed by two 8-position automatic sequential switchers. A manual video switch would be used to connect the third monitor to the spot monitor output of either sequential switcher.

The video recording system was to be a dual system; one in which recording could be initiated locally, in the booking area or remotely, from the Communications Center. Two video tape recorders (VTR) would be used: In the booking area proper, an existing VTR would be placed in service for local recording; in the Communications Center a new VTR would be used for remote recording. Furthermore, since it was desired that the system be capable of simultaneous local and remote recording, a video distribution amplifier was specified to split, without losses, the output of the camera in use for the recording process.

3.1.2 Bidding Process

Specifications for the CCTV system were formulated by the Concord Police Department with assistance from a contractor who specializes in CCTV systems. These specifications delineated the requirements for all equipment, cameras, monitors, VTR, and so on, as well as the responsibilities of the prospective vendor. A description of the proposed system was also furnished for the vendor's benefit. Below is a listing of the requirements/responsibilities delegated to the vendor:

- Installation of all equipment specified.

- Ninety-day equipment delivery.
- One-year guarantee on equipment furnished.
- Ninety-day warranty labor.
- Onsite training and instruction for City personnel.
- Acquisition of permits/payment of fees.
- Inspection of site prior to bidding.
- Clean-up of all work areas.
- Restoration of any damaged area of the building created by the vendor during system installation.

Contract award for the CCTV system was made by the City's Purchasing Office to the lowest responsive bidder. Since no one person expert in the design of CCTV systems was available to the City for consultation, the City was not able to determine immediately, the "responsibility' of any of the bidding vendors. Therefore, the lowest bid was chosen as that which served the City's best interest.

3.1.3 Vendor Noncompliance/Correction of Deficiencies

Following system installation, the CCTV system was inspected by Mr. James Moran, Concord PD, and Mr. F. James Connor, New Hampshire State Police, for compliance to the specifications. In a letter to Chief Walchak, Mr. Connor documented all areas of vendor noncompliance revealed by the inspection. Those items identified by Mr. Connor are delineated below, with correspoinding action taken by the vendor.

- Existing VTR -- The system specifications called out a CCTV monitoring/recording system that would be capable of operation with an existing VTR. This VTR, an older Sony model, was not compatible with the system furnished because it did not meet EIAJ standards for video-tape recorders. A vertical sync problem resulted when interfacing the Sony VTR with the new system. To correct the incompatibility, the vendor traded a used Shibaden VTR, meeting EIAJ standards, for the existing Sony VTR and some additional monies supplied by the purchaser.

- Video Monitors -- Four 15-inch monitors, with audio capability, were specified by the purchaser. The vendor supplied three 9-inch monitors, without audio capability, for use with the two sequential switchers and spot-monitor feature. One 19-inch monitor, with audio capability, was furnished for use with the new VTR. The vendor later replaced the 9-inch monitors with three Sanyo 15-inch monitors that complied with the specifications. The 19-inch monitor supplied for use with the VTR was accepted by the purchaser and retained.
- Video Cameras -- All video cameras, except the low-light level unit, were to have an RF output in addition to the video output. The RF output was to be either Channel 5 or Channel 6, standard VHF television, to enable the cameras to be used with standard TV receivers, should the need arise. The cameras furnished were Panasonic Model WV-200 and did not come equipped with RF outputs. In lieu of alternate cameras, the vendor supplied the purchaser with one Video-to-RF Converter. This unit would permit any one of the cameras in the system to be used with a TV receiver. The purchaser elected to accept the Panasonic cameras and the Converter as meeting his requirements.
- Camera Mounts -- The specifications called for a "high-quality" camera mount for each of the indoor cameras. The mounts provided, Cunningham Corporation CS-10, are of lower quality and lack the operational features of those specified. The mounts provided, although lacking the quality of that specified, were adequate for use with the Panasonic cameras. This being the case, the purchaser accepted "as is" the mounts provided.
- Equipment Cabinet -- A Desk Instrument Cabinet was specified to contain the two sequential video switchers and the one manual switch. The cabinet supplied, made of wood and formica, had a homemade appearance and did not conform with the specifications. The vendor later supplied a metal enclosure that had a more professional appearance, but even this unit does not comply with the requirements of the specifications.

3.2 Evaluation -- Phase II

3.2.1 Equipment Inspection

An inspection of all equipment comprising the CCTV system was made by the Consultant and Mr. James Moran, Concord PD. Any equipment, equipment configurations, or work not meeting specifications, or that which was questionable are identified below. That equipment previously discussed and already accepted by the purchaser is not further described herein.

- Camera Lenses -- The camera lenses originally specified for the 10 detention cells were 4.8mm, ultra wide-angle. The purchaser was not satisfied with these lenses because of their inherent distortion. The vendor agreed to supply the 8.5mm wide-angle lenses now employed. These lenses have less distortion but cannot adequately view the entire cell area.

- Outdoor Camera Housing -- While this housing, itself, appears to meet specifications, it is not readily apparent that it includes the Heater and Blower systems as required. This outdoor housing has a lock that must be opened by a key, which the purchaser was not provided.

- Outdoor Mounting Bracket -- The bracket supporting the Outdoor Low-Light Level Camera and associated housing is attached to the rear outside wall of the Police Station with four machine screws. While these screws are presently supporting the camera, there is concern for the safety of equipment and personnel should external forces (e.g., wind, snow, ice) act upon the camera/bracket system.

- Low-Light Level Camera -- Since the housing containing this camera was locked, it could not be determined whether the camera furnished met the specifications. The camera is a Panasonic model but could not be identified with a model number. Panasonic offers two versions of this style camera: One would meet the purchaser's specifications and one would not.

- Video Distribution Amplifier -- The Cunningham Corporation's Video Distribution Amplifier used to split (without losses) the video output of a camera used in the booking room to simultaneously feed two video tape recorders was found to be in a wrong configuration. The amplifier was used in a bridging mode for both input and output. The amplifiers input bridged a video line interconnecting the booking room camera with the video monitor or a new Hitachi VTR in the Communications Center. Only one output of the distribution amplifier was used (bridging), and this was to feed the video input of the Shibaden recorder in the booking room. While this arrangement may overcome the losses caused by signal division, it does not provide the equipment connected to the amplifier's output with a proper impedance match. Since the distribution amplifier used UHF connectors on both input and output, it was a simple matter to reconfigure the distribution arrangement so that only the camera feeds the input and the two outputs feed each of the recorders respectively. In addition, the terminating mode was selected. Because the configuration of this unit was changed, the video level at the amplifier's output should be checked and readjusted for 1.0 Volts p-p.

- VTR Microphone -- Although the vendor supplied a replacement VTR for the purchaser's existing Sony VTR, he did not replace the associated Sony microphone. The Sony microphone is not compatible with the Shibaden VTR furnished by the vendor. It should be noted here that this trade-in agreement between the vendor and purchaser was not part of the contract requirements.

- Video Monitor Support Shelf -- The three video monitors used in the Communications Center for full-time surveillance are supported by a shelf affixed to a wall by means of four "L" brackets. Only two screws are used to attached each bracket to the wall even though the brackets come drilled with three screw holes for this purpose. Concern must be expressed over this shelf's ability to support three video monitors.

- Desk Instrument Cabinet -- The cabinet furnished to house the video-switching equipment in the Communications Center still does not comply with the specifications. Furthermore, it is missing its rear cover.

- Coaxial Cable Connectors -- A sampling was made of the UHF-type connectors used throughout the system. They are the typical PL-259 series used industry-wide. There are several versions of this connector available, the most common being of the full solder-on configuration and used extensively on this system. None of the connectors inspected, however, had the shield conductor of the coaxial cable soldered to the body of the connector. Moreover, since RG-59 cable was used, a reducing adapter is required when affixing this cable to the UHF connector. Several of these reducing adapters were found to be loosely screwed into the body of the UHF connector.

- Broken Ceiling Tiles -- During system installation, ceiling tiles in various areas of work were broken. To date, the vendor has not replaced these tiles.

- Equipment Manuals -- No operating or maintenance manuals nor technical literature of any kind was provided on the equipment furnished by the vendor. Although this requirement was not specified, one would expect literature describing operation of equipment to be supplied as a minimum.

3.2.2 Operational Test

In addition to the visual inspection of each system component, an operational test was conducted to determine the effectiveness of the system as installed. The following are any system anomalies and/or deficiencies observed.

- Vertical Sync Problem -- In this system, and in most systems of this type, random interlace sync is utilized to keep down the cost of cameras. In the subject system, the transmitted vertical sync is locked to the AC line powering the camera. This usually does not represent a problem even in switched systems. However, for smooth switching to occur (i.e., no loss of sync), all cameras on the system must be powered by

AC lines of a common phase. This is not the case in Concord. The Police Station is served by three-phase electrical service. The three phases are distributed throughout the building and, as a result, the video cameras have no one common phase on which to lock. During the switching process at the monitoring station, a vertical roll of the received picture information is noticed as cameras of different phases are switched in for viewing. Since the switching process is automatic and two banks of eight cameras each are used with two independent sequential switchers, the momentary loss of sync can be quite annoying and fatiguing to the person attempting to observe two monitors. Investigation into the distribution of cameras among the various electrical phases was made. This distribution is shown below.

Camera Bank No. 1

Switcher Position	Location	Phase
1	Lobby	B
2	Cell 1 (male)	A
3	Cell 2 (male)	A
4	Cell 3 (male)	A
5	Cell 4 (male)	B
6	Cell 5 (male)	B
7	Cell 6 (male)	B
8	Cell 7 (female)	A

Camera Bank No. 2

Switcher Position	Location	Phase
1	Cell 8 (female)	A
2	Cell 9 (juvenile)	B
3	Cell 10 (juvenile)	B
4	Rear Building	C
5	Garage	B
6	Garage	B
7	Booking Room	C
8	Cell Block Corridor	B

- Low-Light Level Camera -- When viewing the rear entrance to the Police Station at night with the outdoor camera, it is difficult to distinguish any activity occuring in this area. Because of the nighttime viewing requirement, a high-sensitivity video camera was specified

(minimum required illumination 0.05 footcandles). As mentioned previously, a Panasonic camera was furnished by the vendor for this purpose; but because of a locked housing, its model number could not be verified. There are two models available from Panasonic that look alike externally, but only one is a low-light camera. If it is later determined that the correct camera has been furnished, then it can be assumed that proper scene illumination is lacking at the rear entrance and, therefore, must be provided if satisfactory results are to be obtained.

4. FINDINGS AND CONCLUSIONS

From the foregoing analysis, it can be seen that before the CCTV and Recording System can be considered as "complying with specifications" or "doing the job" additional effort must be spent by both the vendor and the purchaser. A listing of system deficiencies is presented below, followed by responsibilites to be delegated to vendor and purchaser.

4.1 System Deficiencies

- There is an inability to view each cell in its entirety in the detention area of the Police Station because of insufficient viewing angle of lenses used.
- The mounting screws attaching the low-light level camera to the outside wall are too small to support the camera adequately.
- The existing Sony microphone is not compatible with the Shibaden VTR furnished by the vendor for use locally in the booking room.
- The shelf provided by the vendor in the Communications Center appears inadequate to support the weight of the three 15-inch video monitors.
- The Desk Instrument Cabinet containing video-switching equipment does not meet the requirements of the specification in terms of size, convenience, and appearance.
- Coaxial cable connectors are not soldered to the conductor of the cable. This subjects the inner conductor of the cable to undue strain and the outer conductor to corrosion where it contacts the body of the connector.
- A vertical sync problem exists with the two monitors used with the video switchers. This is due to the cameras being split among the three phases of the building's three-phase service.
- Outdoor camera will not perform with satisfactory results at night.

4.2 Vendor Responsibilities

- Provide key for access to outdoor camera housing.
- Increase the size of mounting bolts used to secure the outdoor camera mounting bracket to the outside wall.
- Check, and readjust if necessary, the output level of the video distribution amplifier used to feed the inputs of the two video tape recorders.
- Provide the necessary mounting hardware to secure adequately the shelf in the Communications Center that supports the three video monitors.
- Change out the Desk Instrument Cabinet containing the video-switching equipment for one that complies with the specifications.
- Ensure that all coaxial cable connectors are installed correctly. This includes soldering, tightening, and so on, along with the observance of good engineering practices.
- Replace any ceiling tiles broken during system installation.
- Provide, as a minimum, operating manuals on all equipment furnished as part of the CCTV system.

4.3 Purchaser Responsibilities

- Once a key is obtained for the outdoor camera housing, the purchaser should carefully inspect this assembly to ensure that the specified low-light camera, as well as a blower system and heater were provided. If the low-light camera was provided, it should bear the Panasonic model number of WV-261, which indicates the camera is equipped with a Newvicon camera tube allowing a minimum illumination of 0.05 footcandles. If this camera was not provided, the vendor should be made responsible for supplying the correct camera.
- If it is determined that the low-light level camera was indeed provided for the monitoring of the rear

garage entrance, it would then be in the purchaser's best interest to provide additional scene illumination over that now provided by an existing parking lot security lamp.

- The purchaser should negotiate with the vendor to have the 10 originally supplied 4.8mm lenses returned so that adequate coverage of each detention cell can be obtained.
- The purchaser should also negotiate with the vendor for a replacement microphone to be used with the Shibaden video recorder.
- Steps should be taken to reconfigure some of the electrical circuits powering the video cameras so that the vertical sync problems are minimized.

5. RECOMMENDATIONS

5.1 General Recommendations

- The vendor should be called back to the system to correct the deficiencies outlined in Section 4 as his responsibility before any final payment is made to him. Once these defined problems are remedied, the CCTV system can be considered as "meeting the specifications."

- It is strongly recommended that the purchaser follow the suggestions offered in Section 4. Involved is a negotiation process with the vendor to secure alternate or optional equipment and a system improvement project to overcome the operational difficulties with the system. If the purchaser can comply with his appointed tasks, a system will result that "can do the job."

5.2 Specific Recommendations

It is felt that a more extensive treatment is necessary of two points relating to the operational effectiveness of the CCTV system. These are the vertical sync problem and the lack of scene illumination for the outdoor camera.

- Vertical Sync Problem -- The occurrence of vertical "rolling" in the video monitors could be greatly minimized by a slight reconfiguration of electrical circuits serving the Police Station building. This entails that three 110 VAC circuits be transferred to different phases of electrical service. This could probably be accomplished at the building's entrance panel as follows:

  - Change Booking Room and Rear Building cameras, presently C-phase to A-phase.

  - Change Cell Block Corridor camera presently B-phase to A-phase.

After these changes are made, there will be an even distribution of cameras on the A and B phases remaining (i.e., 8 cameras on A-phase, and 8 cameras on B-phase). The user should then configure each camera bank with like cameras in an order that best suits his needs.

- Scene Illumination -- If it is determined that additional scene illumination is needed at the building rear entrance for nighttime viewing, it is suggested the purchaser procure an outdoor Flourescent Lamp with parabolic reflector (Magna-Ray or equivalent). It would be highly desirable to utilize a lamp with a Lexan cover and a photo-electric control. The photo control would automatically turn on the lamp during any period of darkness regardless of time of day.

5.3 Future Planning

It is further suggested that the purchaser, when procuring future equipment, incorporate the following additional requirements in his specifications:

- List exceptions taken by vendor with detailed explanations.

- Furnish technical literature with each vendor's bid for all equipment offered. This will permit an adequate evaluation of all bids received.

- Furnish installation, operation, and maintenance manuals with equipment.

- A "proof of performance" period during which the vendor verifies proper operation of equipment furnished. Final payment not to be made until a successful performance period is demonstrated.

- Requirement for contractor's insurance -- Liability, Property Damage, and Workmen's Compensation.

END