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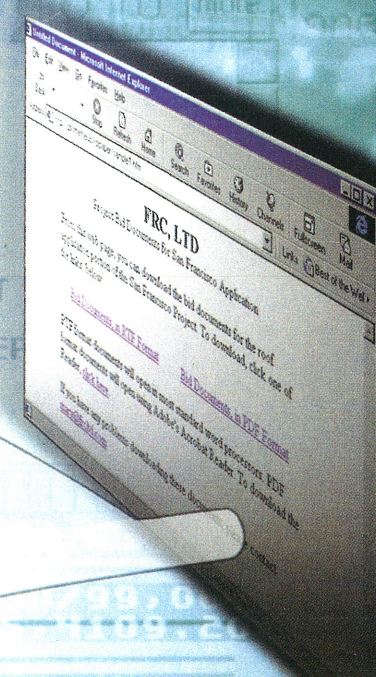
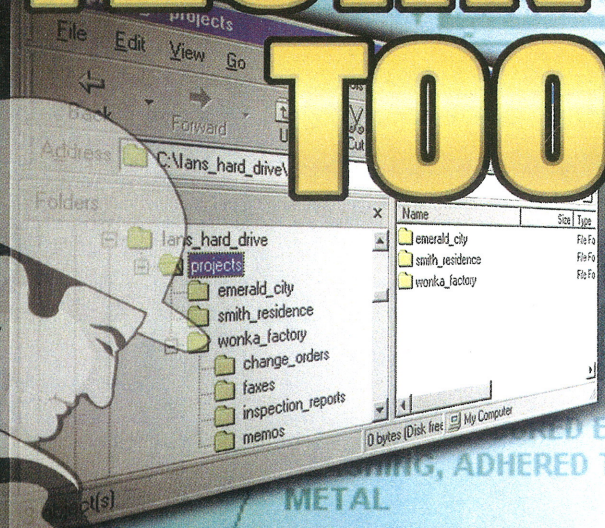
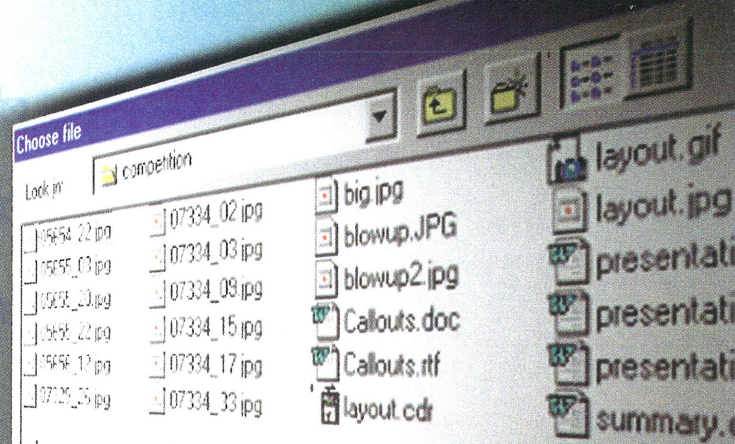
**ROOFTOP ANTENNAS**

**INTERNET INTERFACES**

## NEW TECHNOLOGICAL TOOLS FOR ROOFING

**AERIAL INFRARED SURVEYS**

**COMPUTER-AIDED DESIGN (CAD)**



# ROOF-TOP REAL ESTATE IN A WIRELESS WORLD

BY DONALD KILPATRICK

*Wet insulation uncovered at rough opening for new penthouse addition.*

**T**he ever-growing wireless communication industry has produced a new real estate market sector. Owners of buildings, primarily in large metropolitan areas, are being targeted by proposals from wireless providers to use the roofs of their facilities for antennas critical to specific areas of coverage for their networks. These proposals typically involve monetary compensation for the building owners and some form of lease agreement. It is the building owner's responsibility to review the agreements and determine if the terms and conditions are satisfactory.

The prudent building owner will seek the advice of legal counsel to review the terms and conditions of the agreement.

This action can assist the owner in identifying legal issues related to the lease and proposed installation. Depending on the scope of the project, the engineer of record will submit the plans to local code officials for review. A more diligent building owner will require that the services of a competent roof consultant be included at the outset of the work, with design review and continued involvement through the construction process. A carefully reviewed and properly negotiated agreement with the telecommunication entity should include provisions that they incur the expenses of the aforementioned services. This approach provides the owner with reasonable assurances that his roofing assets are protected.

The scope and type of the proposed installation can range from a simple, ballasted, premanufactured antenna stand to large penthouse additions intended to house sensitive electronic equipment. The plans and specifications that accompany such proposals are typically prepared by design professionals who are not intimately familiar with the detailing required to provide the building owner with uncompromised integrity of his roofing assets.

Property owners actively managing the roofs of their facilities as assets should consider the benefits of requiring due diligence surveys or conditional assessments of the involved roof areas. Either type of service should include, but not be limited to, verification of existing roof system components, type, and, where applicable, condition of structural deck. An infrared scan would

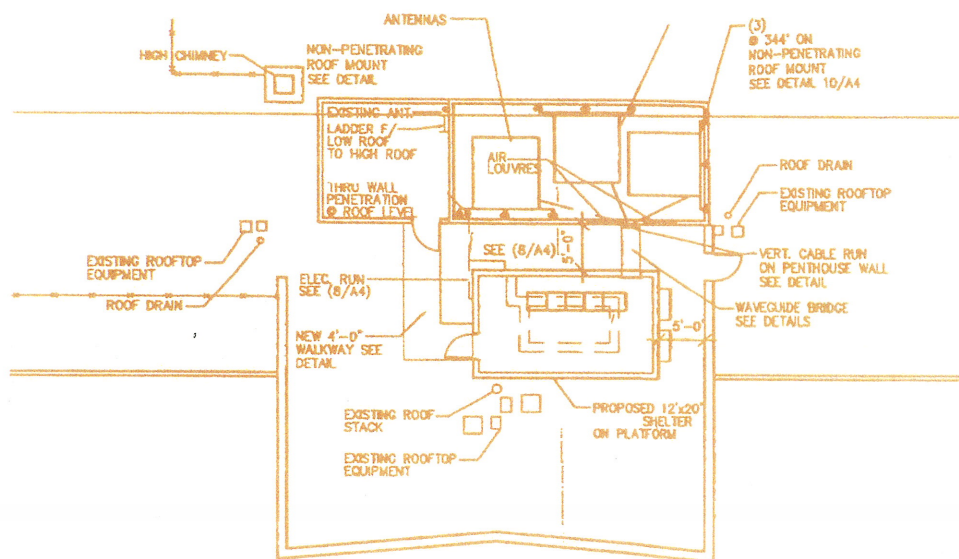


*Figure 1: Both the existing and new penthouses were centered in a bay approximately 50' x 50', with rooftop penetrations limited to several PRV (Powered Roof Ventilators) and one interior roof drain.*

determine the presence of and extent to which moisture may be present. Included should be a scale roof plan with condition photographs, descriptive text discussing existing conditions, and projected service life. If required, cost estimates for remedial repairs or complete reroofing should be included.

At the time of the survey, the building owner's representatives should be prepared to discuss any performance problems related to the existing roof assemblies, disclose and review applicable warranties, and, if available, the names of the installing contractors and primary component suppliers. The importance of this information will be self-evident and may prove beneficial for any building owner during the negotiations with a wireless provider. The information gathered can be used to develop any needed construction documents in an abbreviated format, resulting in an opportunity to solicit competitive bids from a list of prequalified contractors. Depending on the size or scope of the installation, it may be appropriate to involve the original installing contractor in order to properly address ownership issues relative to existing warranties. The interests of all involved parties are then equally represented on what could be an unlevel playing field ripe with confusion and misrepresentation.

### Project Profile

The author's company was recently called upon to witness the installation of an array of antennas and a fairly substantial penthouse addition on a high-rise building in a downtown, major metropolitan area. In this case, the general contractor provided our office with a set of shop drawings pursuant to the proposed installation. The drawings showed that an existing mechanical penthouse roof was to be literally covered with a number of ballasted premanufactured antenna stands, and a new penthouse, approximately 20' long and 12' wide, was to be constructed. Both the existing and new penthouses were centered in a bay approximately 50' x 50', with rooftop penetrations limited to several PRV (Powered Roof Ventilators) and one interior roof drain (Figure 1). No site-specific information relative to existing conditions was provided; and, in all likelihood, the owner had already agreed upon the terms and conditions of the installation.

These projects are generally fast track, resultant of some imposed deadlines related to the vendor's need to have the installation on-line and ready to activate in the specific area targeted for coverage. On our project, the

first day of work focused on the installation of the heavy metal base for the new penthouse addition. The large crane, at \$450 per hour, was staged, picked up the materials at grade, and hoisted them to the subject roof area. The materials delivered included spools of wire, steel framing and metal roof decking, insulation, sheathing, a small roof kettle, roofing felts, and aggregate. The involved roof area soon became littered with the tools and equipment that would be needed by the host of subcontractors assembled to complete the installation.

This was our first opportunity to see the roof and attempt to develop a better understanding of the scope of the project. The rough opening made in the existing roof assembly (appropriately sized and intended for the new penthouse addition) revealed a poured concrete deck, a marginally-attached base layer of tapered expanded polystyrene insulation, a top layer of 1" wood fiber insulation, and an aggregate-surfaced four-ply

*Right: Flashing of existing roof to steel curb.*

*Below: Revised proper flashing conditions with required wood blocking.*





Small fire contained in bucket.

organic/asphalt built-up roof membrane. Reportedly, the existing roof assembly represented original construction and was 16 years old with no history of performance problems.

The contractor opened the roof using an ax in lieu of the cutoff saw that would not start. This "rough" opening allowed the generic identification of roof systems components and uncovered unforeseen conditions, such as wet insulation and a conduit serving a PRV running diagonally across the area. A cutting torch was used to make the required field changes to the

structural steel frame fabricated as the base for the penthouse addition. Notches were cut in the I-beam to accommodate the run of conduit across the involved roof area. The ensuing small fire had minimal impact on what would prove to be an eventful day.

With the necessary modifications in place, the new penthouse base was moved into position on the roof and firmly set in generous applications of an unidentified adhesive, dispensed with a caulking gun. With the base secured to the receiving substrate, the roofer was required to achieve the desired watertight condition by flashing the metal curb/base to the existing roof membrane. The outside vertical surface of the curb was shop-primed 1/8" plate steel with no means by which to nail it to the top of the new base flashing. A series of phone calls to the engineer of record, building owner, and general contractor was required to address detail issues and the discovery of the wet insulation. In the end, all interested parties were miraculously able to work through the unforeseen conditions, resulting in a quality installation.

### Summary

This project profile describes some of the things that can be expected when a lack of charter exists between a group of individuals, all having different understandings of expectations.

A proactive role on behalf of the building owner would have addressed the majority of the surprises and resultant changes encountered on this installation. With this important role unfilled, there can be significant interruptions of occupancy and unacceptable risks to the continued or expected performance of rooftop assets. Accurate information, shared among the participants, will result in a quality installation with the interests of the building owner and each of the involved trades properly represented. ■

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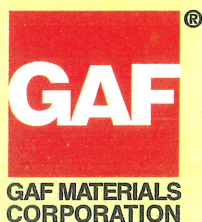
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## ABOUT THE AUTHOR

### Donald Kilpatrick

began work at INSPEC, Inc.'s Minneapolis, MN office in 1985 and has been involved in all aspects of roof consulting. His duties include roof system design, construction observation, roof evaluation, and forensic evaluation. Don is a professional member of RCI, a member of RCI's Interface Peer Review Subcommittee, and serves on ASTM Committee D-08.



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