

# Providing a Solution for Effective and Efficient Inspection Service Delivery

## INSPECTION CONTEXT

Inspection service delivery is usually a tradeoff between meeting customer expectations for customized arrival time requests and route planning efficiency. This is especially true in larger jurisdictions, where inspectors may drive more than 80 miles during the day. More efficient routes reduce miles driven and associated costs, and reduce inspector windshield time, thereby providing more inspection time. However, clients dislike this approach because it lacks consistency in arrival times and inspector assignments, resulting in planning uncertainties and more phone calls to inspectors requesting estimated time of arrivals (ETA). In short, efficient inspection delivery conflicts with effective delivery from the client's perspective.

But what if we were able to provide efficient routing, as well as ETAs, while accommodating special requests for inspection times? This article proposes an approach which meets these objectives, increasing customer satisfaction for effective inspections, while reducing overall inspection delivery costs.

## EFFECTIVE INSPECTION ROUTING

The more efficient the inspection routing, the lower the costs associated with miles driven and the greater the available field inspection time. This means to achieve the most efficient routes, assigned inspector areas must be dissolved, and all inspections for a



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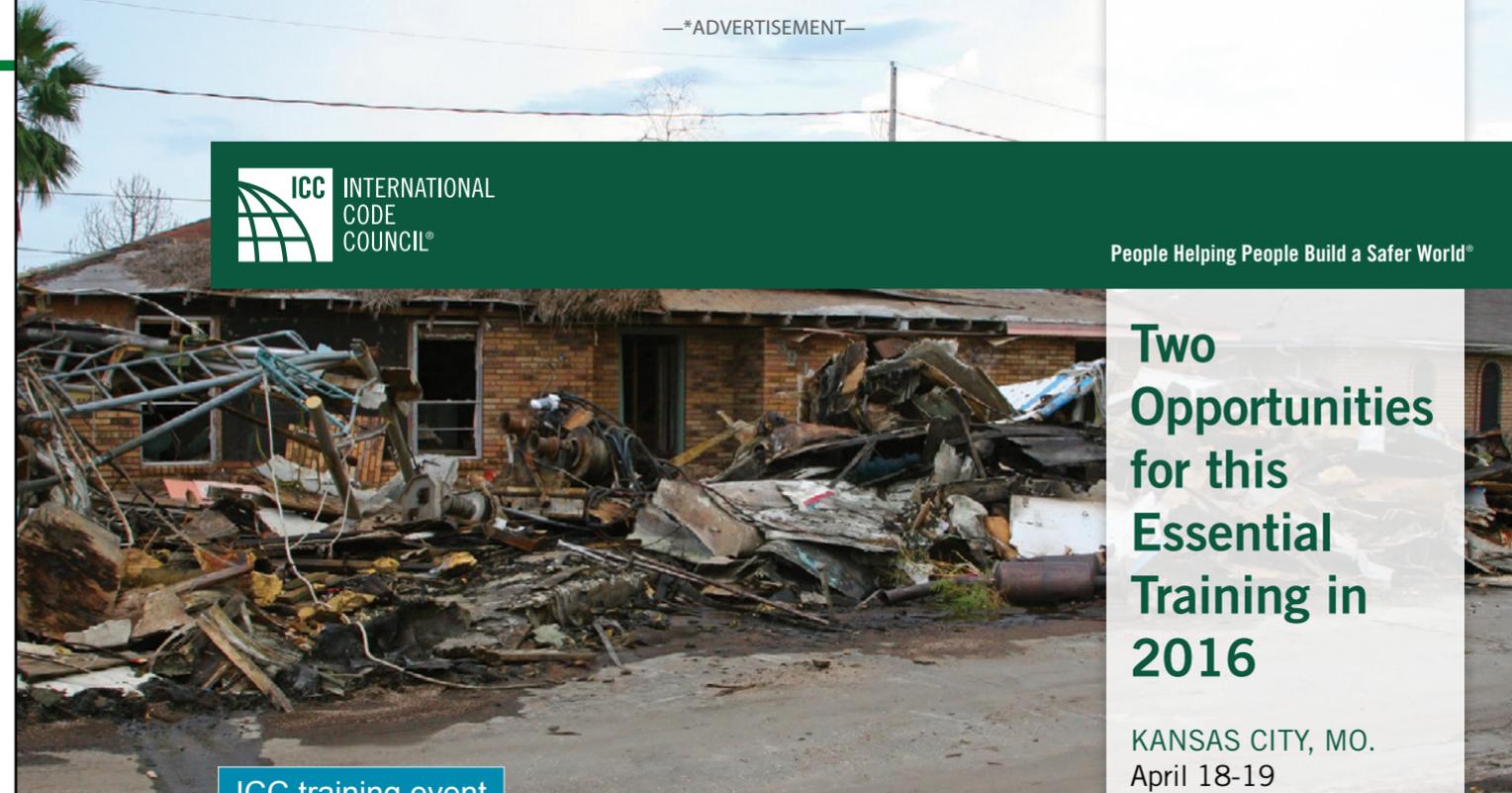
jurisdiction must be candidates for assignment to the inspector pool working that particular day. This would be predicated on certain factors, including: a calendar of inspector availability; inspector start location; estimated time required to complete each scheduled inspection; inspection location; and drive time.

A calendar of inspector availability is necessary to determine which inspectors will be working on a particular day. If inspectors always start their inspection routes from the same location, the names of the particular inspectors are not important, and the calendar would need to include only the number of inspectors working that day. However, if each inspector route start location differs, the names are important in determining a routing solution. In Pima County, Ariz., for example, inspectors download and start their inspection routes at their homes on all days, except on regular meeting days, which occur a minimum of once every two weeks when all routes start from the office.

A routing solution also depends on the amount of time required to complete each inspection, so as to more evenly distribute workload. Inspection time depends both on the type of inspection and the application of a particular inspection within a category of building. For example, weights can be assigned to each inspection type, so an electrical service clearance inspection could be attributed less weight than an intermediate framing inspection. Weighting also needs to consider the square feet of the building, and the use/occupancy of the building (as an I-2 will take much more time to inspect than an S group occupancy). The solution can automatically calculate these factors directly from the data tables within the permitting system.

Inspection location and drive time are the last factors necessary to evenly distribute inspector workload. The solution must therefore contain an effective routing methodology, preferably consuming Geographic Information System (GIS) street network maps generated by the jurisdiction in lieu of generically available Google or other map types. The advantage of using a customized mapping source is to more effectively capture newly created addresses and streets, which may take a few months to show up in commercial mapping services. If a local street/address network is not available, it is best to use latitude/longitude for the parcel centroid projected to the boundary fronting the street, so that it may locate them in commercial maps where no matching address/street is found.

The routing solution may be executed in a GIS-based environment such as the ESRI Vehicle Routing Problem (VRP), where dozens of attributes may be adjusted to provide



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the most effective route distribution. Once calibrated, the solution looks to the permitting system information, inspector calendar of availability, start locations and the local street network to execute the most equitable distribution of inspection workload across inspectors, all while minimizing drive time. This means one inspector may be assigned five inspections, while another is assigned 16, due to differences in complexity of inspection and drive time between locations.

The inspection GIS solution then can be fed back into the permitting system for inspection assignments, so they can be downloaded for the next business day. Additionally, inspectors may be emailed a personal hyperlink containing imbedded data for their daily route. Clicking on this link activates turn-by-turn voice routing on their smartphone through their inspection stops.

### MEETING CUSTOMER EXPECTATION FOR ESTIMATED TIME OF ARRIVAL

Another benefit of the vehicle routing solution is that ETAs can be generated and auto-emailed to clients the business day prior to the scheduled inspection day, notifying them of the time window for their inspection. Additionally, this data also can feed a webpage containing a table of permit numbers and time windows where inspections may be resulted in real time for client viewing. Providing ETAs to clients allows them to plan their days, drastically reducing the number of calls to inspectors, meaning more quality inspection time.

### CUSTOMER REQUESTS FOR SPECIFIC INSPECTION TIMES

While the inspection auto-routing solution provides the aforementioned advantages, it does not allow customers to determine specific inspection times based on their business needs. Otherwise, efficiencies and commitment to ETAs would be lost. To be successful, auto-routing therefore needs to provide alternative solutions accommodating custom inspection time requests.

While using more inspectors would allow for custom times, this would defeat efficiency gains from auto-routing. An alternative would be to provide a remote inspection program using video conferencing. This would eliminate the need for an on-site inspector and provide clients with the flexibility of scheduling an inspection a few minutes prior to their desired time, depending on availability.



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This introduces the possibility of just-in-time inspection requests, which greatly help in minimizing down-time associated with power kills for service upgrades, or allowing contractors installing HVAC or water heater equipment to have their installation inspected while they are still on site, instead of turning that responsibility over to the building owner.

An easy method to accomplish this is to use a freeware service, such as Skype, to conduct the inspection. Clients should be told they will need a 4G wireless device and Internet service at the job site, a Skype account, inspection tools depending on the type of inspection (such as tape measure, receptacle tester, step ladder), low background noise environment, etc.

A calendar service also is needed to allow clients to schedule inspections at their desired time. The calendar inspection slots can be based on the number of remote inspectors available to provide this service. For example, if one inspector is dedicated to providing remote inspections, the inspection slots initially may be spaced 30 minutes apart. But if five inspectors are assigned, available slots could be spaced five minutes apart, reducing customer wait times.

The calendaring service could have the users create a profile to collect their Skype name and cell phone numbers. It also could collect the permit number and what inspection(s) is requested, as well as explain what is required to be ready for the Skype inspection: needed tools, have device charged, turn off phone notifications during Skype call, accept Skype call at the street in front of the property so that the inspector may view the building and address, etc.

The client selects an available time slot (which could be five minutes away) and at the scheduled time, the remote inspector opens the permitting information and project plans to ready him/herself for the inspection and then calls the client via Skype, using a hands free phone headset. The inspector then talks the client through moving the camera in all areas where visibility is desired. Requests may be placed for an item to be measured, or for the client to step on a small ladder to obtain a better view of a raised item.

### MANAGING INSPECTION SERVICES FOR EFFECTIVENESS AND EFFICIENCY

In summary, the synergy created by combining an auto-routing solution with a remote inspection program provides a strategy for:

- Minimizing inspector drive time and miles driven
- Increasing inspection resources to conduct inspections

- Increasing customer satisfaction by providing ETAs the business day prior to the scheduled inspection date
- Increasing customer satisfaction by providing remote delivery for just-in-time inspections

Implementing the auto-routing solution and remote inspection program in Pima County, Ariz., has resulted in a 20-percent reduction in inspector drive mileage/time, which translates not only into a commensurate reduction in transportation related costs, but also in a commensurate net increase in inspection personnel resources without having to add staff. We also have observed that since the routing solution does not always send the same inspector to the same job site, overall inspector consistency is actually improved by providing each inspector exposure to other inspector points of view, thereby providing the additional benefit of cross-training. **BSJO**

*Yves Khawam is an ICC-certified Master Code Professional and Chief Building Official for Pima County, Arizona.*

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