



Performance Specifications for Traffic Management

1st International Conference on
Transportation Construction Management

February 10, 2009

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Strategic Highway Research Program II

- SHRP 2 established in 2006
- Rapid Renewal
 - High Speed
 - Minimal Disruption
 - Long Life
- Performance Specifications (Project No. R07)
 - Baker - Work Zone Traffic Management

**Goal - Develop Guidance Performance
Specification for Work Zone Traffic Management**

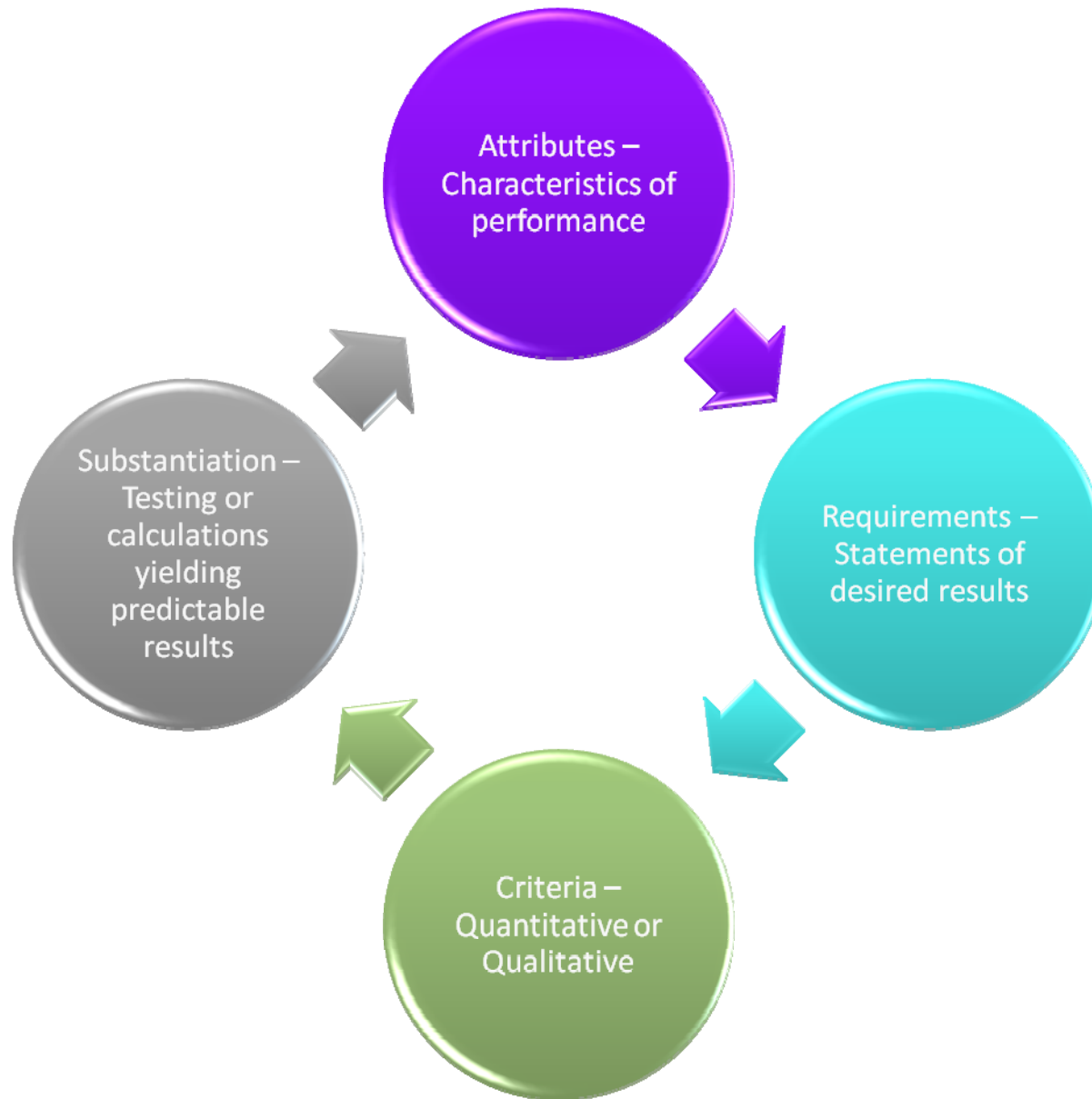
Definitions

- Prescriptive Specification - Recipe describing materials (products) to be used and the steps or methods required to fabricate and install the materials.
- Performance Specifications – Statement of required results with criteria for verifying compliance. (CSI)

Performance Specification Goal

- Means to transfer the burden of achieving success to the contractor in exchange for providing the contractor with significantly more flexibility than exists under traditional prescriptive specifications

Elements of Performance Specifications



Performance Specification Checklist

- Does it describe performance of product at completion of construction?
- Does it describe performance of product sometime in the future?
- Does it leave out method details for material selection, handling, mixing, transport, etc., to the maximum extent possible?
- Does it include method specifications embedded in secondary level specifications such as ASTM, AASHTO, manufacturer's recommended practice, etc?

Performance Specification Checklist

- Does it leave out method details for operations (time, temperatures), to the maximum extent possible?
- Does it clearly define contractor roles and responsibilities?
- Does it clearly explain the owner's oversight, inspection, and review role?
- Does it include corrective action clause if performance is not met? Does it address remediation and who is responsible for that fix?

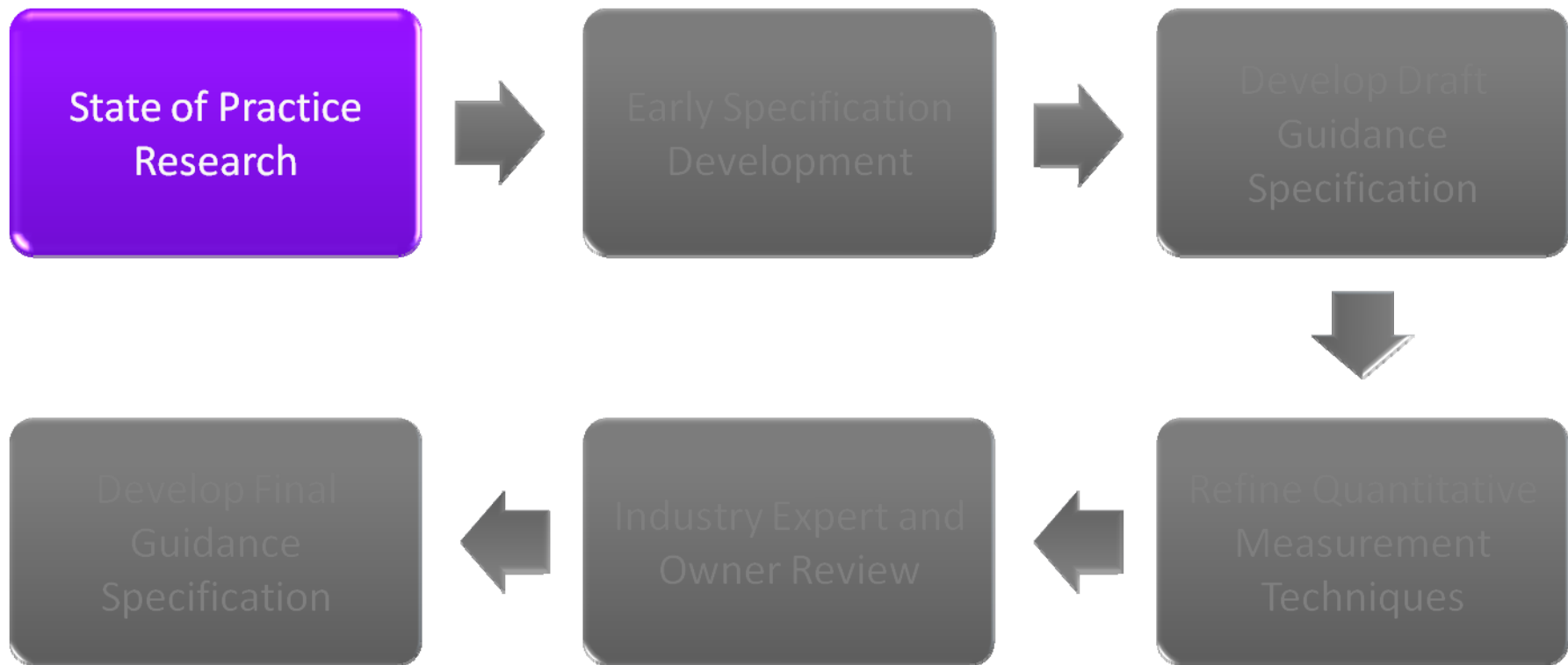
Work Zone Traffic Management (WZTM)

Performance Specification Development Process



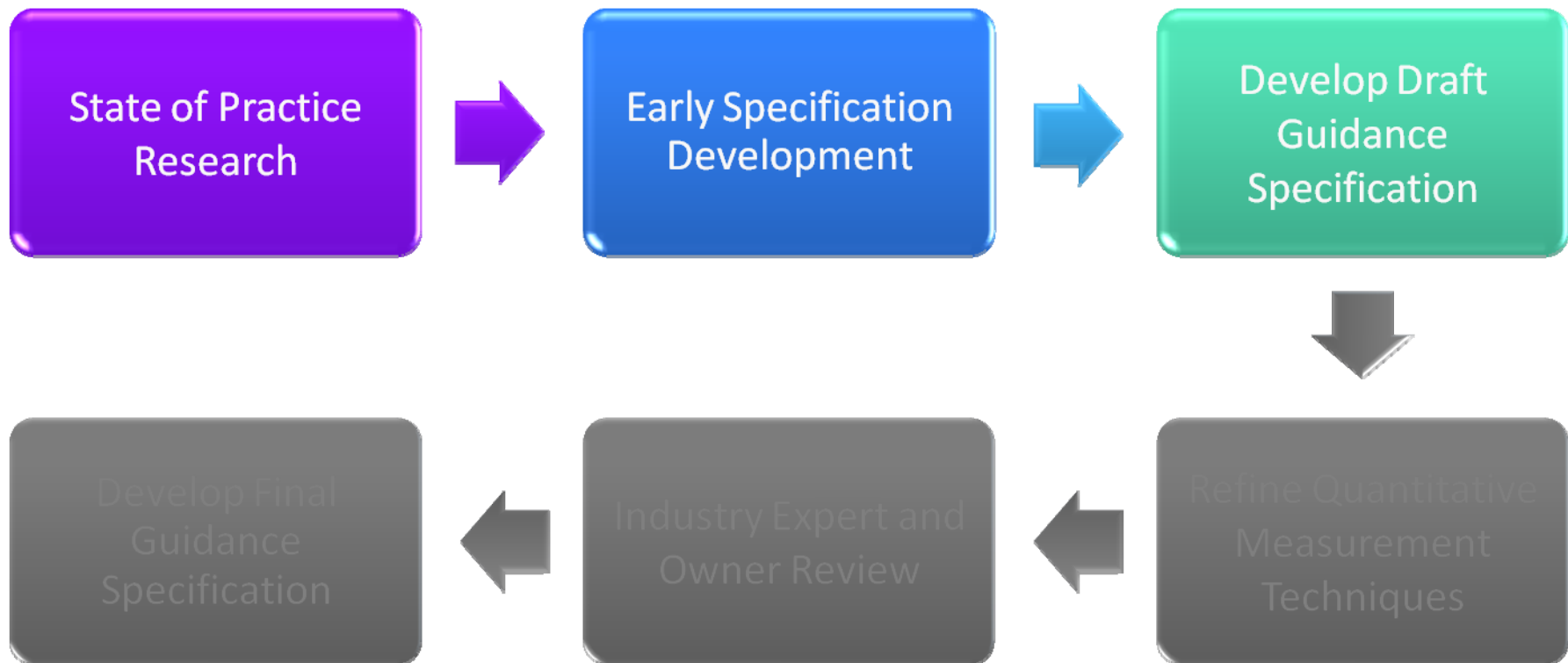
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State of Practice Research

- Majority of WZTM specifications are prescriptive
- WZTM performance specification writing is primitive
- Small # of agencies using WZTM performance specifications or considering
- Many “performance” specifications are not performance related at all
 - Example: “Provide a safe travel corridor.”
 - Performance: “Limit crashes to two per month.”



State of Practice Research

- Many agencies maintain control over contractors, limiting innovation
- Both clear performance measures AND concession of detailed control are essential
 - Example: “Any deviation from the manual requires a review...”
 - Performance: “Submit general traffic plan for review two weeks prior to closure.”



State of Practice Research

- Innovative contracting techniques - more common than true performance specifications
 - A+B Bidding
 - Lane Rental
 - Lump Sum Traffic Control

State of Practice Research

- **A+B Bidding**
 - Bids calculated using price and duration

- **Lane Rental**
 - Charge contractor rental fee per lane based on the estimated cost of delay or inconvenience to the user

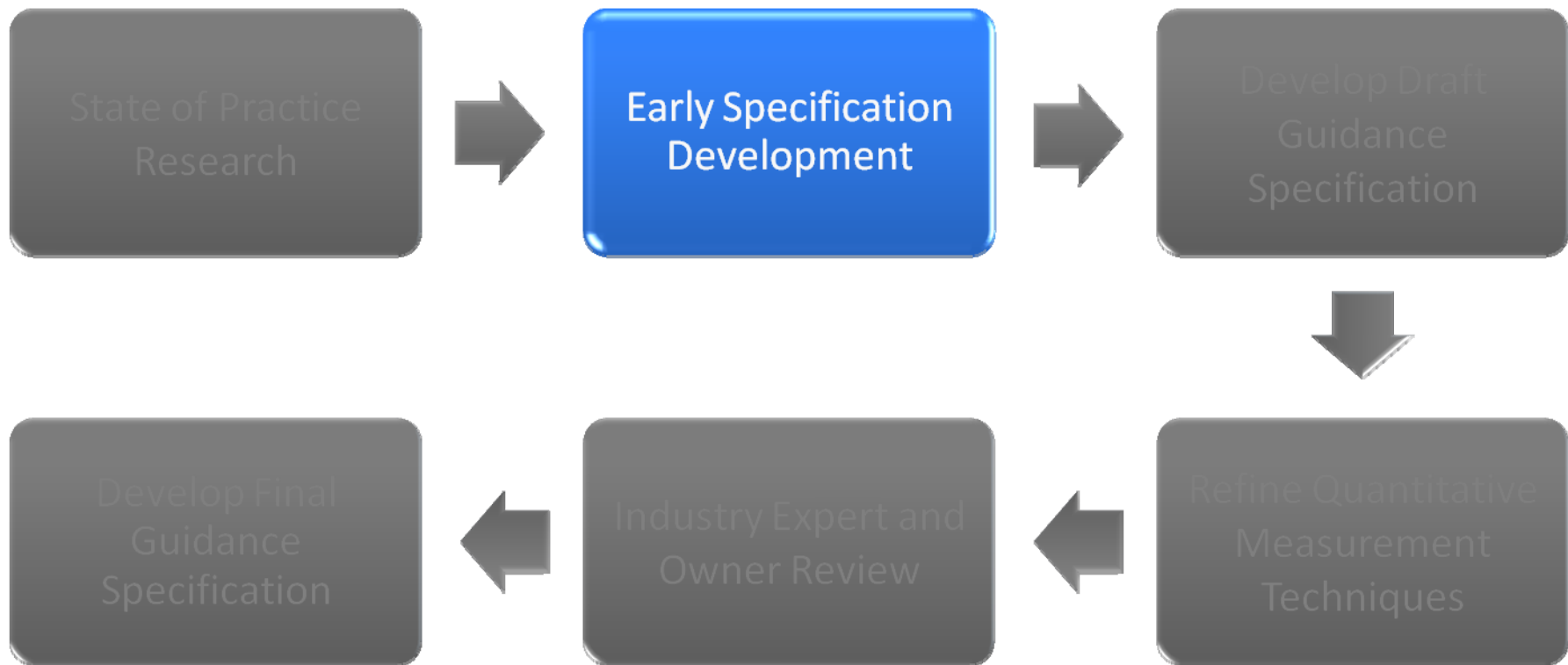
- **Lump Sum Traffic Control**
 - Method to streamline traffic control unit items into single item

State of Practice Research

- Ideal Work Zone Traffic Control Performance Specification
 - General Description and Definitions
 - Limited reference to outside specifications/manuals
 - Outline of submittals to agency
 - List of metrics and associated payment

Work Zone Traffic Management (WZTM)

Performance Specification Development Process

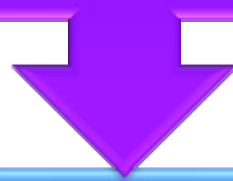


Early Specification Development

1. Determine Subject Matter Expert Team
2. Brainstorm Specification Framework (Matrix)
 - a. Determine User Needs
 - Public/Road User
 - Owner
 - b. Develop Performance Parameters
 - c. Develop Measurement Technique
 - d. Determine Performance Values
 - e. Develop Verification and Testing Techniques
 - f. Identify Gaps

Early Specification Development

Determine Subject Matter Expert Team



Brainstorm Specification Framework (Matrix)

Determine User Needs

Develop Performance Parameters

Develop Measurement Technique

Determine Performance Values

Develop Verification and Testing Techniques

Identify Gaps

Early Specification Development

User Need	Performance Parameter	Measurement Technique ¹	Performance Values	Verification ² (Testing/Inspection)	Gaps
Public/Road User					
Minimize Delay	Travel time thru work zone	<ol style="list-style-type: none"> Multiple travel time runs Multiple vehicle tracking (i.e. CCTV, license plates...etc.) Approximated travel time using spot speeds (automated or manual techniques) 	Maintain target travel time (T) or less for specified time period (X): $T = [\text{work zone length (in ft)}/\text{work zone speed limit (in ft/s)}] \times [1 + \text{allowable change for time period X (in percent)}]$	<ol style="list-style-type: none"> Periodic independent travel time runs Periodic independent vehicle tracking (i.e surveillance, license plates...etc.) Periodic inspection of contractor's measurements 	<ul style="list-style-type: none"> Reliability of technology Statistical insignificance of sample size Calculates "average" delay over entire work zone Work zone should include both the physical and advance of the work zone
	Traffic volume/capacity	<ol style="list-style-type: none"> Count vehicles entering or exiting work zone (automated or manual techniques) 	Maintain target minimum volume (V) or greater for specified time period (X): $V = \text{Preconstruction hourly volume} \times \text{allowable reduction (in percent)}$	<ol style="list-style-type: none"> Periodic independent counts entering or exiting work zone. Periodic inspection of contractor's records/measurements 	<ul style="list-style-type: none"> Reliability of technology Lag time between data verification and corrective action can be implemented Does not account for diversion of traffic
	Queue Length	<ol style="list-style-type: none"> Observation of traffic queues (CCTV or visual) Queue length detectors 	Maintain target maximum queue length (L_x) or less for specified time period (X): $L_x = \text{Allowable maximum queue based on agency method/preference and project conditions}$	<ol style="list-style-type: none"> Periodic independent observation (CCTV or visual) Periodic inspection of queue detection reports/output 	<ul style="list-style-type: none"> Reliability of latest technology
	Road-User Cost	<ol style="list-style-type: none"> Calculation by owner of user cost per vehicle (in dollars) based on "travel time thru work zone" – Can be applied to Lane Rental contracting technique 	Maintain target maximum Road-User cost (RUC_x) or less for specified time period (X): $RUC_x = RUC \text{ Preconstruction} \times (1 + \text{allowable increase for time period X (in percent)})$ <i>[cost agency willing to accept]</i>	Periodic independent observations and inspection of contractor's data to calculate actual RUC	<ul style="list-style-type: none"> Does not account for diversion of traffic to alternative routes
	Delay for Short-Term, Full Roadway Closure	<ol style="list-style-type: none"> Observation to record closure time 	Maintain target maximum roadway closure time (T_x) or less for specified time period (X).	<ol style="list-style-type: none"> Independent observations/ measurement Inspect records/measurements 	

Early Specification Development

User Need	Performance Parameter	Measurement Technique ¹	Performance Values	Verification ² (Testing/Inspection)	Gaps
Public/Road User					
Maintain Access/Mobility	Incident Clearance Time	1. Physical time from notification to clear an incident that effects traffic and safety in the work zone	Maintain target minimum clearance time (T) or less, as indicated.	1. Inspect contractor's records 2. Inspect police reports	• Contractor may not be in control of the removal if higher authorities are become involved.
	Minimize Impact of Detours	1. Length of proposed detours 2. Travel time of proposed detours 3. Duration of proposed detours	Maintain maximum detour length, L, as indicated. Maintain maximum detour travel time (T) or less, as indicated. Maintain maximum detour duration (D) or less, as indicated.	1. Agency approval of proposed detour 2. Agency monitoring of the construction schedule	• Unforeseen circumstances that effect the construction duration
	Police, Fire, and EMS Connectivity	Presence of parameter	Maintain connectivity	Periodic visual inspection	
	Pedestrians/Bicyclists/Boaters Circulation	Presence of parameter	Maintain circulation	Periodic visual inspection	
Public Safety – Safe Work Zone	Number of fatalities, injuries and property damage only crashes	Using crash reports, develop a severity index during construction	Do not exceed baseline severity index (SI) during construction.	N/A – owner to calculate SI under measurement	• Statistical variability of crash patterns and occurrences
Incident Response (monitoring only)	Time to respond to an incident	Physical time from occurrence to notification of authorities	Maintain target minimum response time (T) or less, as indicated.	1. Inspect contractor's records 2. Inspect police reports	• Tracking of time of incident may be difficult

Early Specification Development

User Need	Performance Parameter	Measurement Technique ¹	Performance Values	Verification ² (Testing/Inspection)	Gaps
Public/Road User					
Minimize Ambient Impacts	Minimize construction noise	1.Noise meter 2.Number of complaints	Maintain noise below target noise level (N_x) for specified time period (X).	1.Periodic independent noise monitoring 2.Periodic inspection of contractor's measurements	
	Minimize light pollution	1.Light meter 2.Number of complaints	Maintain light below target light level (L).	1.Periodic independent light monitoring 2.Periodic inspection of contractor's measurements	
	Minimize driver distractions	Number of complaints	Maintain number of complaints below target maximum number of complaints.	N/A	•Cause of complaints is hard to identify/quantify
Minimize Construction Duration	Calendar days	Number of days for the project	Maintain target duration (D) or less (based on engr's schedule) of the project by X days. Possible methods to allow include: •Nighttime/weekend work •Detours •Temporary roads/bridges •Construction sequencing •Innovative contracting (i.e. lane rental, A+Bx, incentive/disincentive)	1.Review of actual completion vs. original projections 2.Review of original completion vs. projections	•Subjectivity of what is actual completion
	Calendar days for critical segments/locations/stages	Number of days for the critical segments/locations/stages			
Keep Informed	Lead time for messages, press releases...etc	Number of days of advance notice	Maintain target time duration (T) or more for notification of appropriate agencies or users.	Review contractor's records/ correspondence	
	Volume of motorist information strategies employed via appropriate media	Number of strategies	Maintain target number of strategies (S) or more for notification of appropriate agencies or users.	Review contractor records/ correspondence	

Early Specification Development

User Need	Performance Parameter	Measurement Technique ¹	Performance Values	Verification ² (Testing/Inspection)	Gaps
DOT/Owner					
Minimize Liability	Number of fatalities, injuries and property damage only crashes	Using crash reports, develop the severity index during construction	Minimize severity index (SI) during construction.	Calculation of severity index during construction	•Difficult to assign fault for crash
Worker Safety (traffic control related)	Number of worker fatalities/injuries involving the general public	Number of incursions into the work zone	Eliminate the number of incursions (I) into the work zone during construction.	1.Observation 2.OSHA reports	•Verification is difficult
Positive Public Relations	Ambient Distractions (Noise & Lighting)	Number of complaints	Maintain target maximum number of complaints	N/A – Owner to determine the number of complaints	•Cause of complaints is hard to identify/quantify
	Travel time				
	Motorist visibility				
Response to Traffic Control Deficiencies (maintenance items)	Time to address deficiency as per plan	Physical time from deficiency notification to correction by contractor	Maintain target minimum time (T) or less to address the deficiency	Observation that deficiency was corrected in a timely manner	
Response to Unforeseen Deficiencies (additional items necessitated by field conditions)	Time to address a traffic control deficiency that has been identified				

Early Spec Dev – Additional Considerations

- Impact of Various Contracting Techniques on Work Zone Traffic Control Specifications
 - Design-Build - Low Bid
 - Design-Build - Best Value
 - Traditional Bidding
 - A+B
 - Design-Build-Operation-Maintain (DBOM)
 - Lane Rental

Early Spec Dev – Additional Considerations

- Impact of Various Contracting Techniques on Work Zone Traffic Control Specifications
 - In General, Minimal Impact
 - A+B and Lane Rental – impact to Mobility
 - Minimizing Delay ↓
 - Maintaining Access/Mobility ↓
 - Minimize Construction Duration ↑

**Sacrifice Delay and Mobility
for Time and Money**

Early Spec Dev – Additional Considerations

- Impact of Various Contracting Techniques on Work Zone Traffic Control Specifications
 - Quicker Construction at the Expense of Safety?
 - Concern for Agencies
 - Leads to Reluctance on Relinquishing Control

Early Spec Dev – Additional Considerations

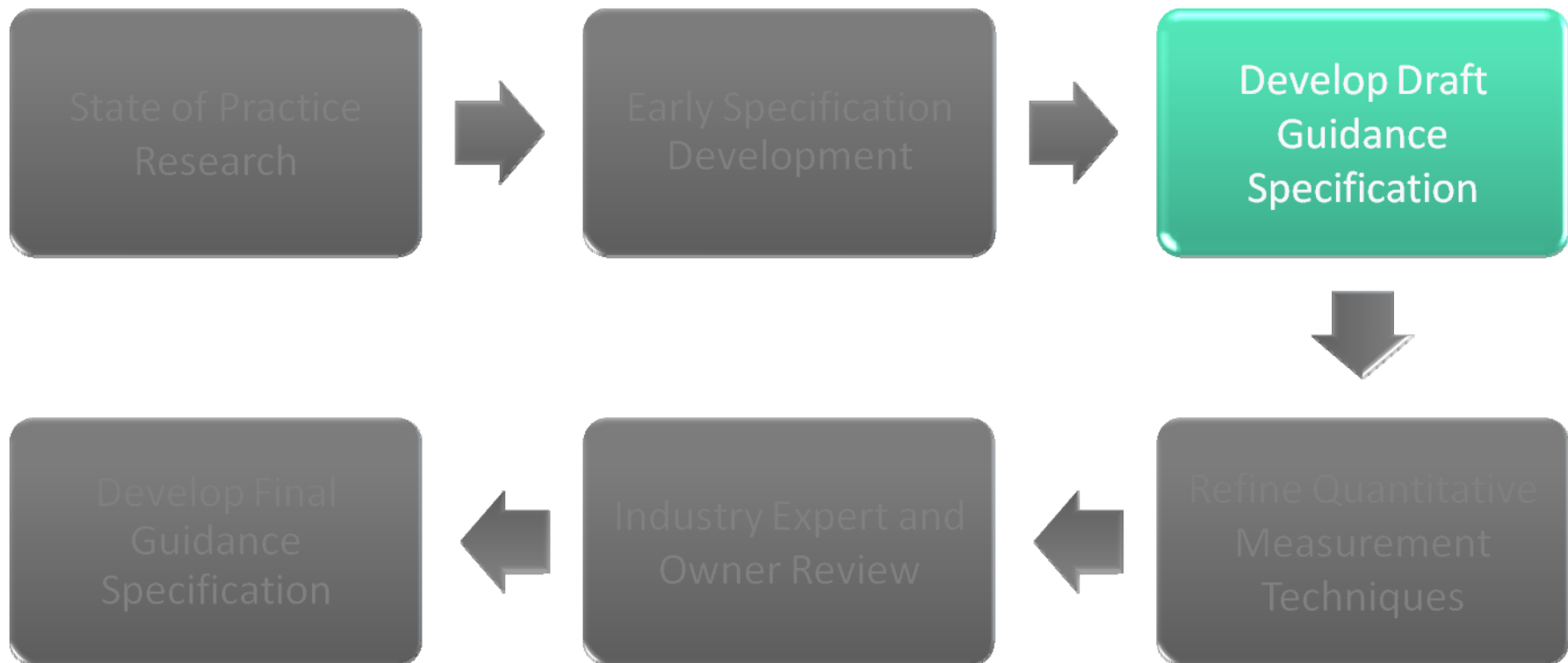
- When Performance Specifications for Traffic Control Should be Applied
 - Most Projects of Size, Type, Location or Contracting Technique
 - Best Applications
 - Rehabilitation-type (3R), Non-Complex Projects
 - Small Bridge Replacements
 - Design-Build to Permit Innovation
 - Proceed with Caution
 - Urban, Complex Projects

Early Spec Dev – Additional Considerations

- **Conclusions**
 - Performance Specs for WZTM:
 - Need to Be Written Correctly – Minimize Agency Oversight
 - Focus on Outcomes Rather than Methods

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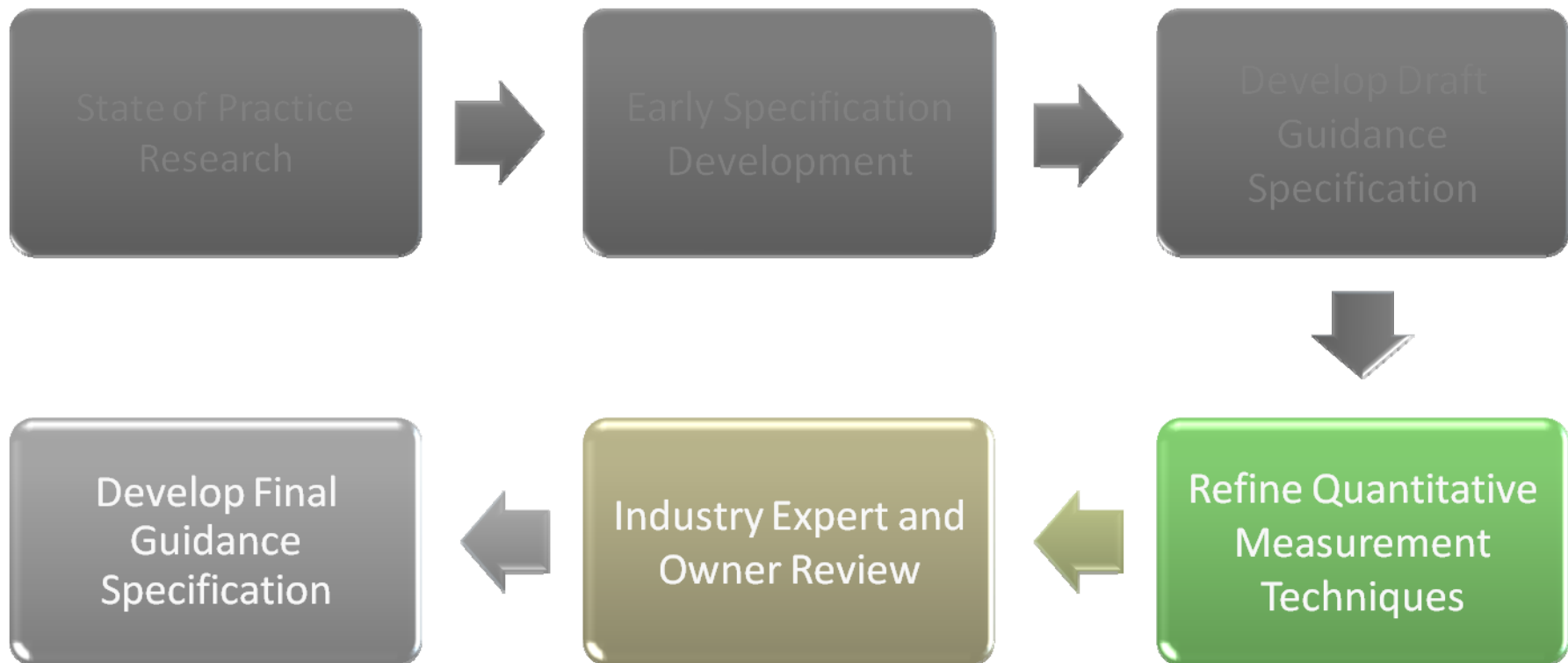


Develop Draft Guidance Specification

1. Develop Specification Outline
 - Description
 - Definitions
 - Materials
 - Construction
 - Measurement and Payment
2. Integrate Performance Parameters
2. Develop Draft Specification

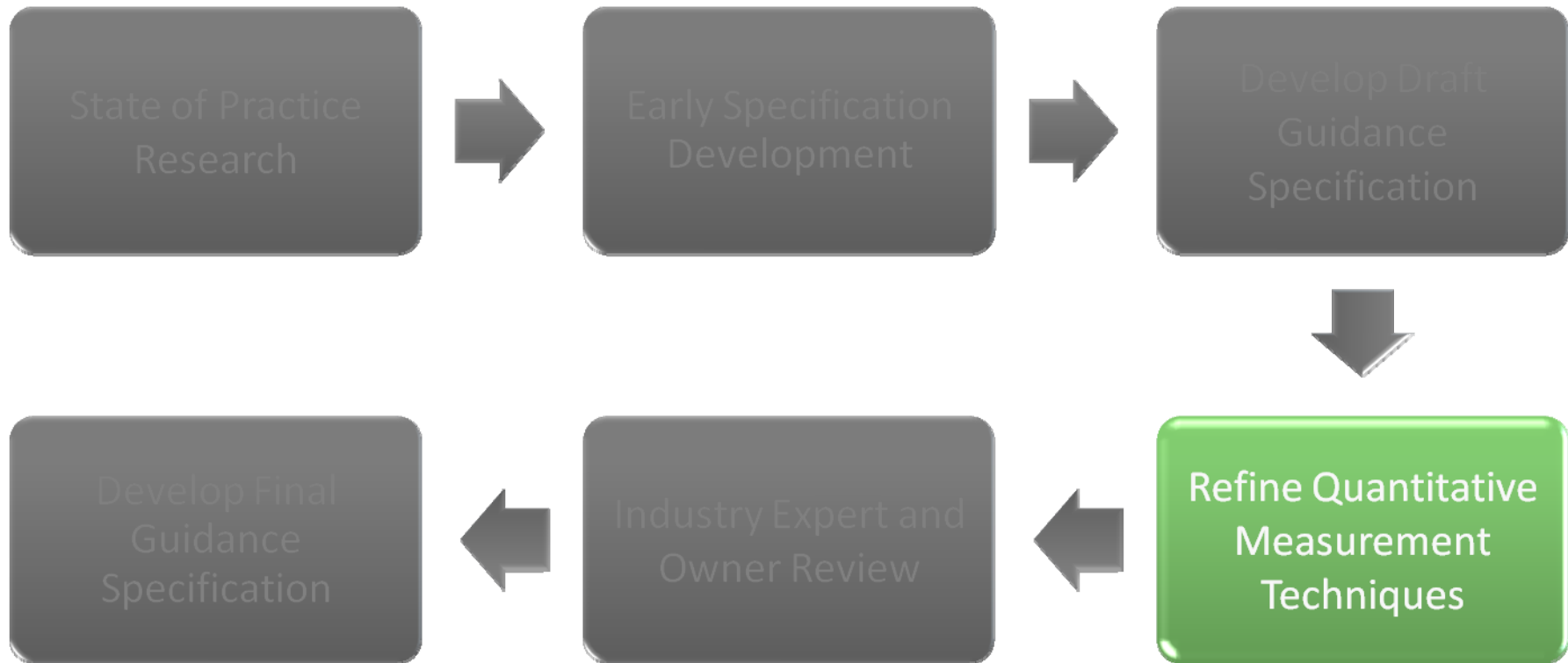
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Next Steps?

1. Invite Owner and Industry Experts to Workshop to Reach Consensus on Measurement Strategies
 - What to Measure
 - How to Measure
 - How to Set Performance Measures, Limits or Thresholds
 - How to Verify Measurement Results
3. Assess Risk
4. Determine Performance Parameters and Measurement Techniques to be Carried Forward
5. Develop a “Disruption Index”
6. Refine Matrix and Draft Specification
7. Owner and Industry Review

Next Steps?

8. Finalize Guidance Specification
9. Break Out Parameters and Measures that Align Best by Contract Delivery/Procurement Methods

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Questions?

