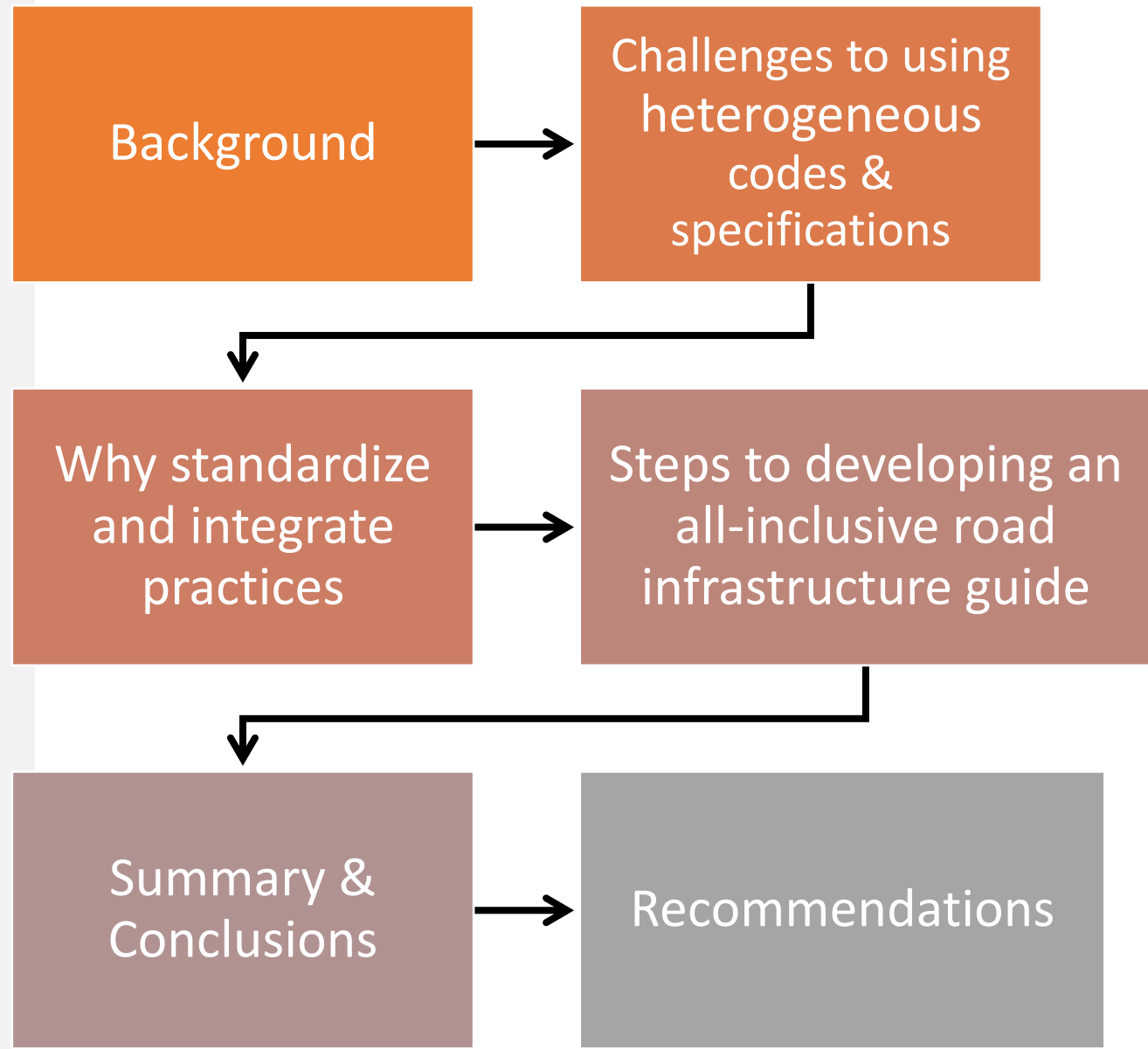# A Framework for Standardization and Integration of Design Practices for Road Infrastructure

Sam Owusu-Ababio, Ph.D, P.E.
Civil & Environmental Engineering Dept.
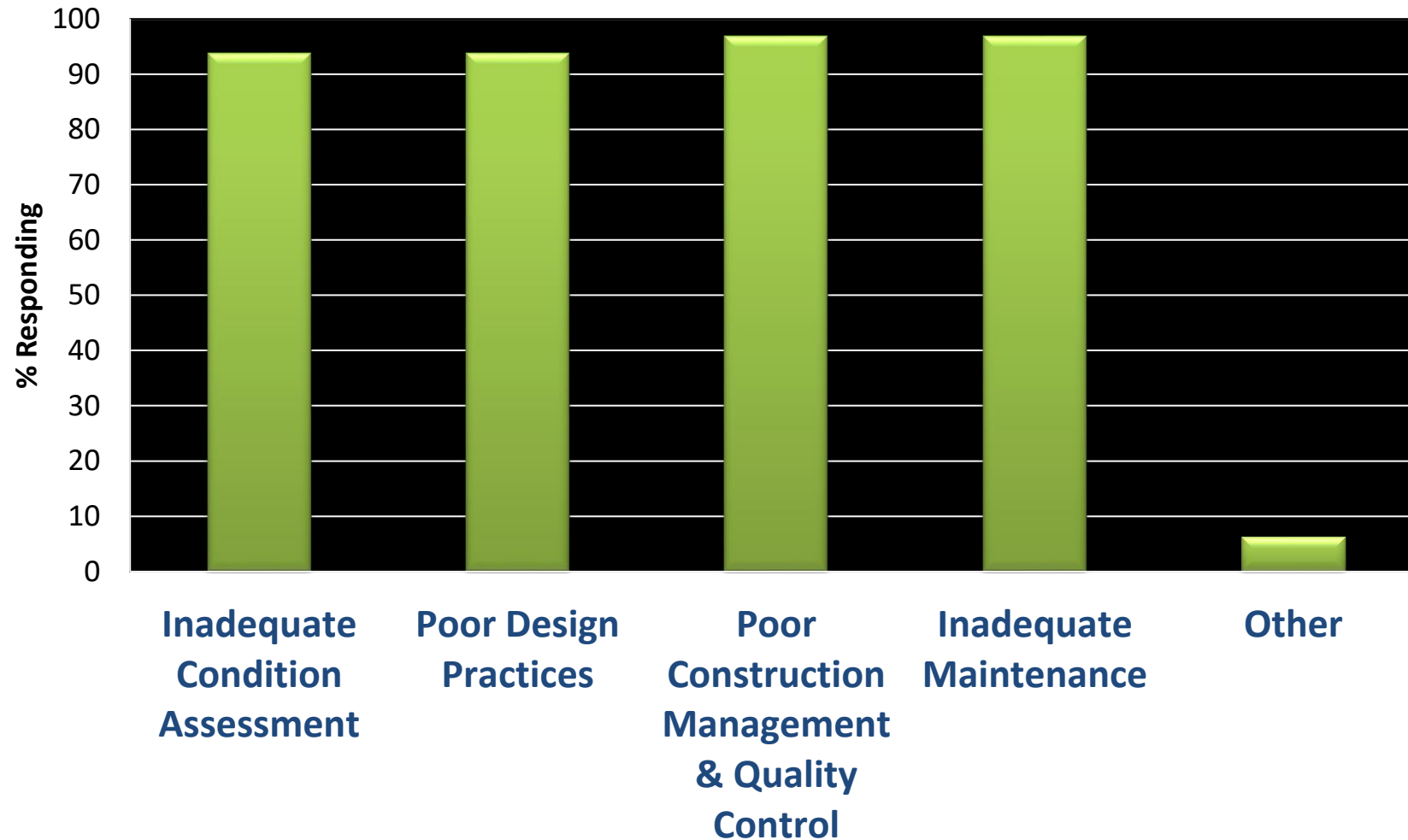**University of Wisconsin-Platteville, USA**

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Outline

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┌─────────────────┐        ┌─────────────────────┐
│                 │        │ Challenges to using │
│   Background    │  ───▶  │   heterogeneous     │
│                 │        │      codes &        │
│                 │        │   specifications    │
└─────────────────┘        └─────────────────────┘
                                      │
                                      ▼
┌─────────────────┐        ┌─────────────────────┐
│ Why standardize │        │ Steps to developing │
│  and integrate  │  ───▶  │   an all-inclusive  │
│    practices    │        │ road infrastructure │
│                 │        │        guide        │
└─────────────────┘        └─────────────────────┘
                                      │
                                      ▼
┌─────────────────┐        ┌─────────────────────┐
│   Summary &     │  ───▶  │   Recommendations   │
│  Conclusions    │        │                     │
└─────────────────┘        └─────────────────────┘
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Background

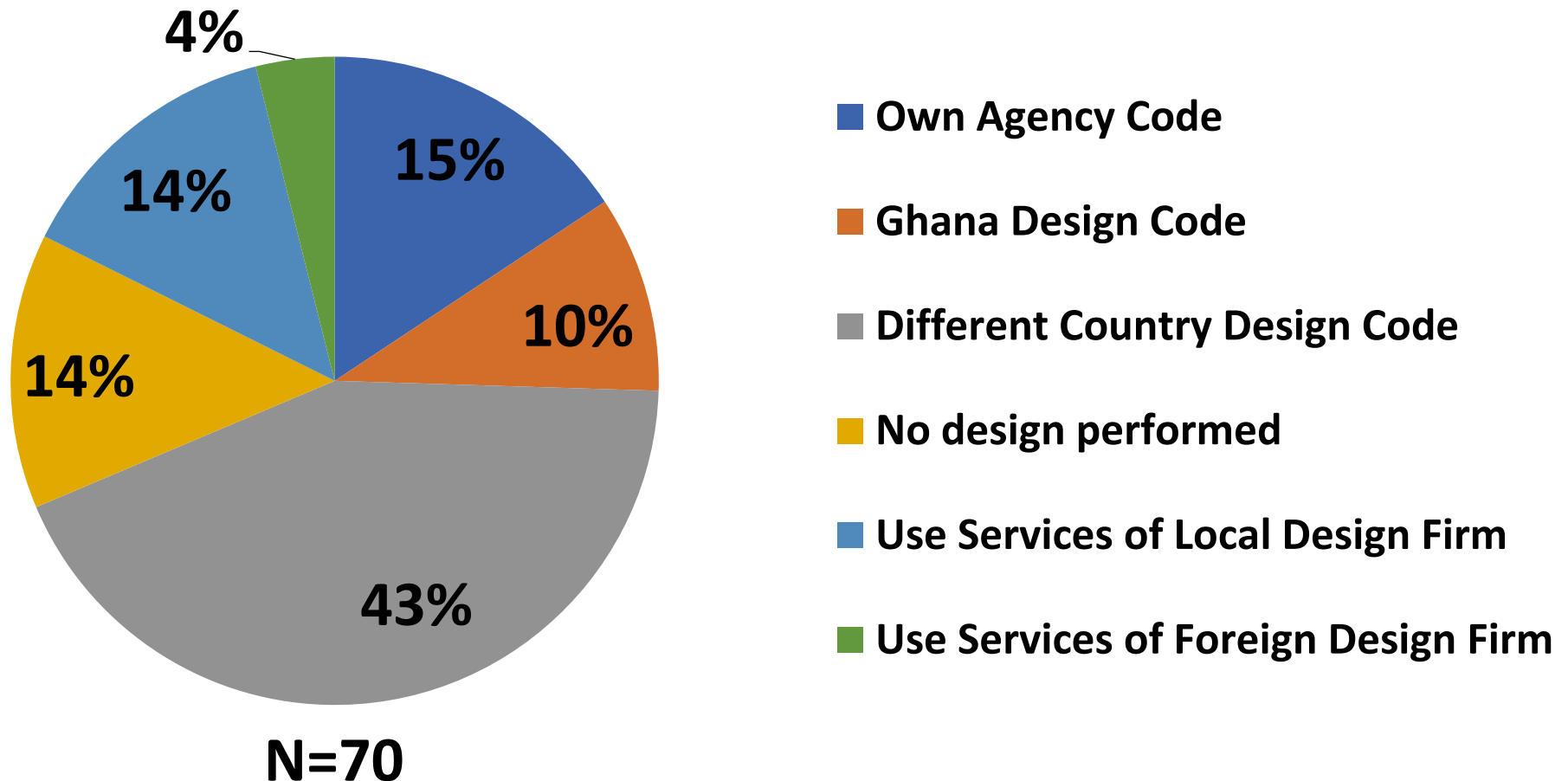Year of Roads Initiative

2014 Survey of Built Environment Professionals

Reasons for Premature Failures of Infrastructure

Codes used for Infrastructure Design

4%

15%

14%

14%

10%

43%

N=70

- Own Agency Code
- Ghana Design Code
- Different Country Design Code
- No design performed
- Use Services of Local Design Firm
- Use Services of Foreign Design Firm

Challenges to using Heterogeneous Design Codes and Specifications

- Lack of uniformity in design, construction, maintenance, & operational standards

- Codes may be outdated and do not reflect changing needs of facility users

- Potential for overdesign => less money for other development projects

- Potential for under-design =>
  - Premature failures with expensive repairs
  - Compromised public safety and welfare

Uniformity in Application of Directional Signs???

Advance Warning Sign Messaging Consistency??

Authorization to use right-of-way for private purposes??

On-street parking and Pedestrian + Bicycle facilities??

Drainage Feature and Pavement Relationship??

Roadside and Clear Zone Requirements ??

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Why Standardization and Integration of Practices?

- Support the goals of "Year of Roads" Initiative
- Consistency in road infrastructure related practices
- Regulatory guide to design, construction, operations, & maintenance
- Basis for controlling road infrastructure costs
- Longer life of road infrastructure
- Basis to properly assess & track infrastructure performance
- Basis to assessing customer satisfaction/expectations on infrastructure performance
- Practical learning tool to incorporate in engineering curricular at the college level

An All-inclusive Ghana Road Infrastructure Guide (GRiG) is Needed !!!

Developing an all-inclusive GRiG

1. Identify road infrastructure components

2. Form committees based on component expertise

3. Gather all existing design codes/manuals & specifications for all components and pass on to the various committees

4. Create a draft master GRiG content outline

5. Committees review all existing codes/manuals for components and consolidate information under chapter and sub-headings

6. Committee submits draft documents to GRiG coordinator for review by an implementation team

7. Committees revise documents based on feedback from implementation team

8. GRiG coordinator and implementation team create final GRiG document and disseminate online to make it readily accessible
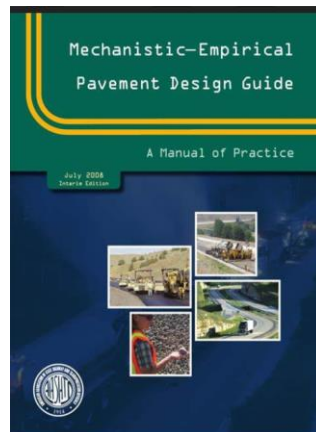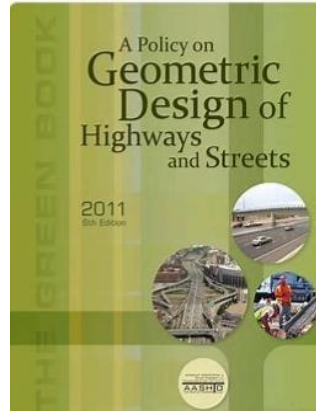
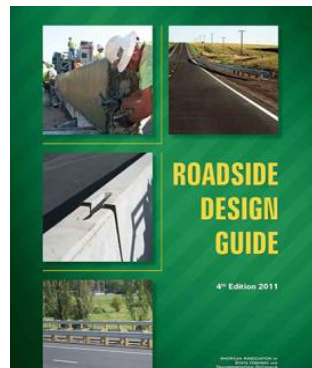# Step 1: Identify Road Infrastructure Components

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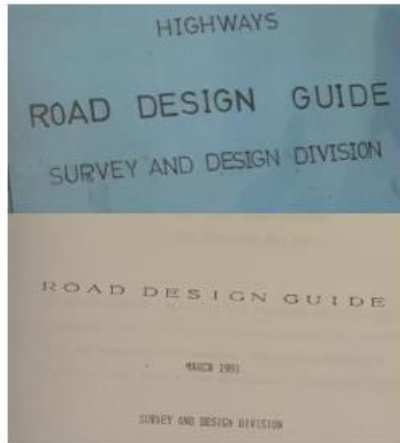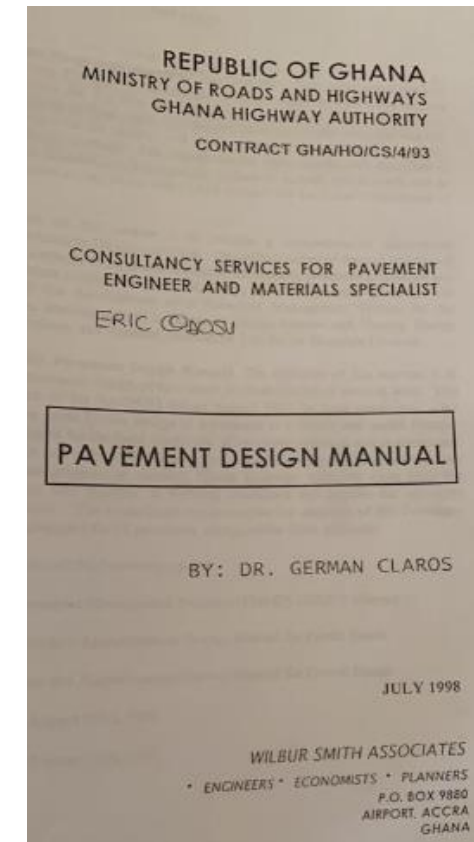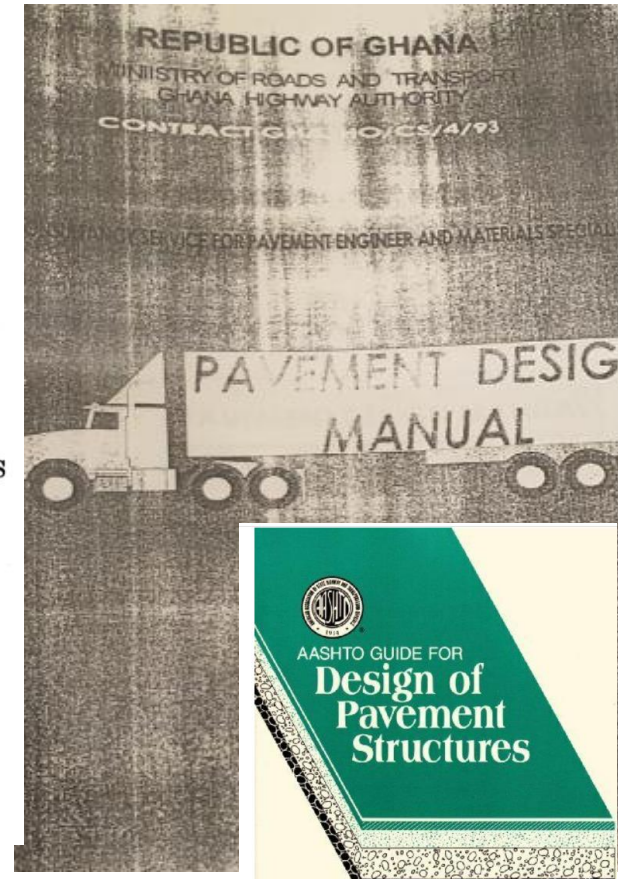# Step 2: Committees & Sub-Committees Based on Expertise

- Bridges, Tunnels, and Toll Booth (BT^2 Committee)

- Pavement Structural Design (PSD Committee)

- Surface & Subsurface Drainage Design (S2D2 Committee)

- Alignment, Roadside, & Lighting Design (ARLD Committee)

- Traffic Control (TC Committee)

Step 4:Sample GRiG Master Content Outline

Chapter 1 Introduction to GRiG	**Chapter 2 Road Infrastructure Development Process**	**Chapter 3 Environmental Laws, Policies, & Regulations**	**Chapter 4 Road Infrastructure Categories**	**Chapter 5 GIS, Surveying & Mapping**
Chapter 6 Geometric Design	**Chapter 7 Roadside Design**	**Chapter 8 Drainage Design**	**Chapter 9 Pavement Structural Design**	**Chapter 10 Traffic Control**
Chapter 11 Tunnel Design	**Chapter 12 Bridge Design**	**Chapter 13 Toll Booths**	**Chapter 14 Plan Preparation**	**Chapter 15 Standard Detail Drawings**

Ghana Road Infrastructure Guide Organization

- Organized by chapters

- Chapters organized by sections

- Sections organized by subsections

- A combination of a subsection number and its corresponding

section and chapter numbers will constitute a "Procedure number"

- Procedure 6-3-5   => chapter 6, section 3, subsection 5

Agency Coordination in Road Infrastructure Development Process

Road Infrastructure Category	Agency/group to Coordinate and Collaborate with
Bridges	EPA
Tunnels	EPA, ECG
Toll Booth	ECG
Traffic control devices	ECG, structures division
Pavements	PURC/GWCL , property owners
Alignment	EPA, Property owners, PURC

GRiG Implementation & Updates

- Establish overall timeline for GRiG implementation
- Establish persons responsible to receive and review applied research findings and practitioner feedback for GRiG updates
- Establish persons who have authority to approve updates pertaining to specific chapters
- Establish persons who have authority to perform updates
- Establish when updates go into effect (within x-days after approval by designated authority or on a specified cycle)

Summary and Conclusions

- Success of "Year of Roads" initiative depends on the quality of existing design, construction, operational, & maintenance practices

- Design of road infrastructure components rely heavily on heterogeneous foreign codes

- Use of heterogeneous codes does not promote consistency in the implementation of road infrastructure and the optimal use of funds for development

- Guides for planning, design, construction, operation, and maintenance of road infrastructure components are not readily accessible

- There is inadequate coordination between agencies when it comes to road infrastructure planning & delivery

Recommendations

An online all-inclusive road infrastructure guide is needed to promote consistency, efficiency, cost savings, and practitioner knowledge in road infrastructure planning, design, and delivery

Publish GRiG online for easy access