# Geosynthetic Reinforced Soil—Integrated Bridge Systems (G-R-S I-B-S) Video

**SCENE 1:**

CONVENTIONALLY, REINFORCED CONCRETE PIERS HAVE BEEN THE SUPPORT STRUCTURE OF CHOICE FOR MODERN-DAY BRIDGE CONSTRUCTION. HOWEVER, AS TECHNOLOGY ADVANCES, CONVENTION SEEMS TO BE SHIFTING. THERE'S A NEW KID ON THE BLOCK CALLED GEOSYNTHETIC REINFORCED SOIL, OR G-R-S; AND IT'S CHANGING THE FOOTPRINT OF MANY MODERN-DAY STRUCTURES. ALTHOUGH GEOSYNTHETIC REINFORCED SOIL HAS BEEN AROUND AWHILE, ITS USE AS PART OF AN INTEGRATED BRIDGE SYSTEM, OR I-B-S, IS FAIRLY NEW.

**SCENE 2:**

THE CONCEPT OF GEOSYNTHETIC REINFORCED SOIL CAME ABOUT IN THE EARLY 1970'S WHEN THE U.S. FOREST SERVICE USED NON-WOVEN GEOTEXTILES TO BUILD BURRITO WALLS WRAPPED FACED WALLS IN THE STEEP MOUNTAIN TERRAIN FOR LOGGING ROADS. THE COLORADO D-O-T, DURING THAT TIME, TOOK NOTICE OF WHAT THE U.S. FOREST SERVICE WAS DOING AND REFINED THE TECHNOLOGY.

IN ABOUT THE MID-1990'S WE ACTUALLY BUILT A FULL-SCALE EXPERIMENT HERE AT TURNER-FAIRBANK HIGHWAY RESEARCH CENTER IN MCLEAN, VIRGINIA TO DEMONSTRATE THE LOAD BEARING CAPACITY OF REINFORCED SOIL. WE DETERMINED THAT IT IS EXTREMELY PREDICTABLE WHEN YOU BUILD IT IN A CLOSELY SPACED FASHION AS WE DO TODAY IN THE I-B-S. A COUPLE OF YEARS LATER WE WERE GIVEN THE OPPORTUNITY HERE AT TURNER-FAIRBANK TO BUILD THE PROTOTYPE I-B-S. AND AFTER THE SUCCESS OF THAT PROJECT, IN THE EARLY 2000'S THE F-H-W-A INTRODUCED THE BRIDGE OF THE FUTURE INITIATIVE AND WE PIGGY-BACKED ON THAT CONCEPT AND WE CONTINUED TO WORK WITH THE D-O-TS AND WITH THE LOCALS TO SEEK OUT PROJECTS TO BUILD G-R-S ABUTMENTS AND THE I-B-S.

**SCENE 3:**

IN 2005, DEFIANCE COUNTY, OHIO, BUILT THE FIRST PRODUCTION I-B-S SYSTEM, THE BOWMAN ROAD BRIDGE. TODAY, THAT BRIDGE IS PERFORMING VERY WELL, AND AS A RESULT, THE COUNTY HAS BUILT 23 OTHER BRIDGES USING THE G-R-S I-B-S SYSTEM.

IN 2010, SAINT LAWRENCE COUNTY IN NEW YORK TOOK NOTICE OF THE SUCCESSES IN DEFIANCE COUNTY AND ARE NOW USING THE TECHNOLOGY TO REPLACE MANY OF THEIR OWN BRIDGES.

**SCENE 4:**

HOW DOES THE G-R-S I-B-S SYSTEM WORK? THE G-R-S I-B-S IS SUPPORTED BY A REINFORCED SOIL FOUNDATION, OR R-S-F. THE R-S-F IS AN ECONOMICAL, SHALLOW FOUNDATION CONSISTING OF LAYERS OF GEOTEXTILE AND COMPACTED FILL. THE G-R-S ABUTMENT AND INTEGRATED APPROACH IS ENGINEERED TO ACCOMMODATE SETTLEMENT, ALLOWING FOR A SMOOTH TRANSITION FROM THE BRIDGE ONTO THE ROADWAY; THUS ALLEVIATING THE "BUMP AT THE BRIDGE" NORMALLY CAUSED BY UNEVEN SETTLEMENT.

**SCENE 5:**

CONSTRUCTING A G-R-S ABUTMENT IS OFTEN DESCRIBED AS BEING AS EASY AS 1-2-3. IT REQUIRES PLACING A ROW OF FACING BLOCK, A LAYER OF GRANULAR FILL, AND A SHEET OF GEOSYNTHETIC REINFORCEMENT AND REPEATING THE PROCESS UP TO THE SPECIFIED HEIGHT OF THE ABUTMENT. THIS METHOD HAS BEEN PROVEN IN THE FIELD TO FACILITATE QUICK AND EFFICIENT CONSTRUCTION WITH IMPRESSIVE RESULTS.

**SCENE 6:**

IT'S FAIRLY SIMPLE ONCE YOU UNDERSTAND THE CONCEPT, THAT BY PUTTING THE SHEETS OF GEOTEXTILE IN THE COMPACTED STONE THAT IT BEHAVES AS A COMPOSITE AND HAS ENGINEERING PROPERTIES. IT HAS A STRESS-STRAIN CURVE THAT IS FAIRLY PREDICTABLE. YOU'RE REALLY DESIGNING THESE ABUTMENTS AS A GRAVITY WALL.

**SCENE 7:**

TO FULLY BENEFIT FROM THE RAPID CONSTRUCTION AVAILABLE USING G-R-S TECHNOLOGY, IT IS IMPORTANT TO FOLLOW GUIDELINES FOR G-R-S ABUTMENT CONSTRUCTION. FIRST, SINCE ALL OTHER COURSES OF BLOCK ARE BUILT OFF THE FIRST ROW, MAKE SURE THAT THE BOTTOM ROW IS LEVEL AND EVEN. SECOND, FOR OPTIMAL PRODUCTIVITY, USE ONLY THE CREW AND EQUIPMENT NECESSARY. DIVIDE THE LABOR INTO THREE BASIC STEPS – STEP 1: LAYING THE BLOCK; STEP 2: PLACING AND COMPACTING THE BACKFILL; AND STEP 3: LAYING A SHEET OF GEOSYNTHETIC REINFORCEMENT. FINALLY, LIMIT THE MOVEMENT OF THE EXCAVATOR TOWARDS THE BACK OF THE ABUTMENT WHERE IT CAN REACH AND PLACE MATERIAL WITHOUT HAVING TO BE MOVED.

**SCENE 8:**

THE WHOLE PROCESS IS FAIRLY RHYTHMATIC; FAIRLY ROUTINE IN TERMS OF ONCE YOU GET THE CONCEPT DOWN OF STACK AND COMPACT IT IS A VERY REPETITIOUS PROCESS. THAT ONCE THAT IDEA IS LEARNED THE REST OF IT JUST BECOMES KIND OF A RHYTHM THAT THE WALL JUST CONSTRUCTS.

**SCENE 9:**

BECAUSE OF THE SIMPLE PROCESS, A LARGE CREW IS NOT NECESSARY TO SUCCESSFULLY CONSTRUCT A G-R-S ABUTMENT. A TYPICAL CONSTRUCTION CREW CONSISTS OF LABORERS AND THE EQUIPMENT OPERATOR.

**SCENE 10:**

IN COMPARISON TO A TRADITIONAL BRIDGE, THE G-R-S I-B-S SYSTEM, I'M GOING TO TELL YOU, IS TEN TIMES MORE SIMPLE FOR YOUR AVERAGE LAYMAN TO BUILD. LIKE I SAID, YOU CAN TAKE MOST LOW CONSTRUCTION PEOPLE, THEY DON'T EVEN HAVE TO BE BRIDGE PEOPLE, YOU CAN START AT THE BOTTOM AND WITHIN A FEW WEEKS YOU CAN HAVE A BRIDGE STANDING.

**SCENE 11:**

SPECIALIZED EQUIPMENT IS NOT REQUIRED TO CONSTRUCT A G-R-S ABUTMENT. READILY AVAILABLE TOOLS LIKE HAND TOOLS AND MEASURING DEVICES ARE ALL THAT'S NECESSARY. HEAVY EQUIPMENT,

SUCH AS A TRACK HOE EXCAVATOR AND A WALK BEHIND VIBRATORY PLATE TAMPER, WILL ALSO BE NEEDED.

**SCENE 12:**

THE FIRST STEP IN CONSTRUCTING THE G-R-S I-B-S IS SITE PREPARATION. SINCE G-R-S TECHNOLOGY REQUIRES BUILDING FROM THE BOTTOM UP, STAGING, AND DELIVERY OF THE MATERIAL SHOULD NOT HAMPER CONTINUOUS CONSTRUCTION. IT IS IMPORTANT THAT DIVERSION TRENCHES BE PLACED AROUND THE PERIMETER OF THE SITE TO DIVERT ANY WATER. AS WITH CONSTRUCTION OF THE G-R-S ABUTMENTS, SITE PREPARATION IS ALSO FAIRLY STRAIGHTFORWARD.

**SCENE 13:**

IT'S A FAIRLY SIMPLE PROCESS OF DIGGING DOWN TO A KNOWN ELEVATION FOR THE FOUNDATION TO BEGIN AND ONCE YOU REACH THAT ELEVATION TO START BUILDING OR CONSTRUCTING THE WALL FROM THE BOTTOM-UP UNTIL YOU REACH THE DESIRED ELEVATION AT THE TOP.

**SCENE 14:**

ONCE THE SITE LAYOUT AND EXCAVATION ARE COMPLETE, IT'S TIME TO BEGIN CONSTRUCTING THE REINFORCED SOIL FOUNDATION. THE BASE SHOULD BE CUT SMOOTH, SLOPED TO DRAIN, AND EXCAVATED TO A UNIFORM DEPTH. ALL LOOSE, UNSTABLE MATERIAL SHOULD BE REMOVED, BACKFILLED, AND COMPACTED TO PROVIDE A GOOD FOUNDATION. LAYING THE REINFORCED SOIL BASE CAN TYPICALLY BE COMPLETED IN 1 DAY.

**SCENE 15:**

THE NEXT STEP IN BUILDING THE G-R-S I-B-S IS TO ENCAPSULATE THE SOIL FOUNDATION WITH GEOTEXTILE TO PREVENT EROSION. TYPICAL SPACING IN THE REINFORCED SOIL FOUNDATION IS 12 INCHES.

**SCENE 16:**

ONCE THE SOIL FOUNDATION HAS BEEN FULLY ENCAPSULATED, COMPACTION BEGINS. PLACE THE FILL FROM THE BACK TO THE FACE OF THE R-S-F AND ROLL OUT ANY FOLDS OR WRINKLES TO THE FREE END OF THE LAYER. THE SOIL FOUNDATION SHOULD BE BACKFILLED IN COMPACTED LIFTS NOT TO EXCEED 6 INCHES. THE FINAL STEP IN THIS PHASE IS BUILDING THE G-R-S BASE. THE TYPICAL BASE IS CONSTRUCTED WITH SPLIT-FACED CONCRETE MASONRY UNITS AND COMPACTED BACKFILL.

**SCENE 17:**

PROPERLY COMPACTED BACKFILL IS CRUCIAL TO G-R-S I-B-S PERFORMANCE. COMPACT ALL AREAS BEHIND THE SPLIT-FACED CONCRETE MASONRY UNITS SO THAT NO VOIDS EXIST BELOW THE GEOSYNTHETIC REINFORCEMENT. A THIN LEVELING LAYER OF FINE AGGREGATE CAN HELP SET THE C-M-U BLOCKS TO GRADE, AND PREVENT THEM FROM ROCKING. THE LEVELING LAYER SHOULD BE KEPT TO A MINIMUM THICKNESS OF NO MORE THAN 0.5 INCHES.

BEFORE PLACING THE GEOSYNTHETIC REINFORCEMENT, IT IS IMPORTANT TO SWEEP OFF ANY GRANULAR FILL FROM THE TOP OF THE BLOCK. THIS WILL PREVENT CRACKING OF THE FACING BLOCKS.

**SCENE 18:**

THE G-R-S PROJECT WILL DETERMINE THE NUMBER OF REINFORCEMENT ZONES NEEDED. REINFORCEMENT ZONES REPRESENT DIFFERENT LENGTHS OF REINFORCEMENT AWAY FROM THE WALL. ROLL OUT THE GEOSYNTHETIC SO THAT THE GREATEST REINFORCEMENT STRENGTH IS PERPENDICULAR TO THE WALL FACE.

WHERE ONE ROLL ENDS, THE NEXT ROLL SHOULD BEGIN. OVERLAPPING BETWEEN THE SHEETS OF REINFORCEMENT IS NOT REQUIRED. ANY EXCESS REINFORCEMENT MATERIAL SHOULD BE REMOVED WITH A RAZOR KNIFE OR A PROPANE TORCH. PREVENTING WRINKLES IN THE REINFORCEMENT MATERIAL IS CRUCIAL. THEREFORE, PLACE THE FILL FROM THE WALL FACE BACKWARD SO THAT ANY WRINKLES THAT DO FORM CAN BE REMOVED. CONSTRUCTION OF THE G-R-S ABUTMENT CONTINUES WITH ALTERNATING LAYERS OF COMPACTED GRANULAR FILL AND GEOSYNTHETIC REINFORCEMENT ACCORDING TO THE DESIGN PLANS.

**SCENE 19:**

AS THE ABUTMENT WALL IS BEING CONSTRUCTED, IT IS CRUCIAL TO MAINTAIN THE PROPER WALL FACE ALIGNMENT. CHECK THE VERTICAL G-R-S WALL FOR PLUMBNESS AT EVERY OTHER LAYER. ANY DEVIATIONS GREATER THAN 0.25 INCHES MUST BE CORRECTED.

**SCENE 20:**

AS THE UPPER LAYERS OF THE G-R-S WALL ARE CONSTRUCTED, A BEARING REINFORCEMENT BED IS CONSTRUCTED TO PROVIDE ADDITIONAL STRENGTH TO SUPPORT THE INCREASED LOADS DUE TO THE BRIDGE. THE BEARING BED REINFORCEMENT SERVES AS AN EMBEDDED FOOTING WITHIN THE G-R-S ABUTMENT. THE SPACING OF THE REINFORCEMENT IN THIS LOCATION IS HALF THE PRIMARY SPACING, OR TWO LAYERS PER COURSE OF BLOCK. THE DEPTH OF THE BEARING REINFORCEMENT ZONE IS DETERMINED BASED ON THE INTERNAL STABILITY DESIGN FOR REQUIRED REINFORCEMENT STRENGTH. AT A MINIMUM, THERE SHOULD BE FIVE BEARING BED REINFORCEMENT LAYERS. FOR A BRIDGE WITH SUPER ELEVATION, IT IS IMPORTANT TO ENSURE THAT THE MINIMUM NUMBER OF BEARING BED REINFORCEMENT LAYERS BENEATH THE BEAM SEAT IS INSTALLED ACROSS THE LENGTH OF THE ABUTMENT FACE.

AT THIS POINT THE REINFORCEMENT LAYERS BECOME STAIR STEPPED WITH REINFORCEMENT TERMINATING ALONG THE ANGLED SURFACE OF THE ELEVATION. PINNING AND GROUTING THE UPPER THREE COURSES OF BLOCK COMPLETES CONSTRUCTION OF THE FACING WALL. IT IS IMPORTANT TO SUSPEND ANY CONSTRUCTION ACTIVITY NEAR THE FACE ONCE THE TOP OF THE WALL HAS BEEN PINNED AND GROUTED TO AVOID WALL DISPLACEMENT.

**SCENE 21:**

ONCE THE ABUTMENT WALL IS COMPLETED, THE BEAM SEAT IS CONSTRUCTED DIRECTLY ABOVE THE BEARING BED REINFORCEMENT ZONE. THE SUPERSTRUCTURE WILL BE POSITIONED ON TOP OF THE BEAM SEAT.

**SCENE 22:**

PROPER BEAM SEAT CONSTRUCTION BEGINS BY 4 INCHES OF PRE-CUT FOAM BOARD ON TOP OF THE BEARING BED REINFORCEMENT. IT IS IMPORTANT TO MAKE SURE THE FOAM BOARD IS BUTTED AGAINST THE BACK FACE OF THE BLOCK.

**SCENE 23:**

NEXT, PLACE A SOLID CONCRETE BLOCK ON TOP OF THE FOAM BOARD ACROSS THE ENTIRE LENGTH OF THE BEARING AREA.

**SCENE 24:**

THE FINAL STEP IS WRAPPING THE LAYERS OF COMPACTED FILL. THE THICKNESS OF THE WRAPPED LAYERS IS ESSENTIAL TO MAINTAINING THE FINAL BEAM ELEVATION. THE FILL THICKNESS OF THE FIRST 4-INCH WRAPPED LAYER SHOULD BE COMPACTED TO THE TOP OF THE FOAM BOARD. THE FILL THICKNESS OF THE SECOND WRAPPED LAYER SHOULD BE COMPACTED TO THE TOP OF THE SOLID BLOCK. THE TOP OF THIS SECOND LAYER CONTROLS THE BEAM ELEVATION; THEREFORE IT SHOULD BE CAREFULLY COMPACTED AND GRADED.

**SCENE 25:**

AS AN OPTION, ALUMINUM FLASHING CAN BE INSTALLED AFTER CONSTRUCTION OF THE BEAM SEAT AND PRIOR TO SETTING THE BRIDGE BEAMS. IF USED, THE FLASHING SERVES AS BOTH A DRIP EDGE AND A CLEAR SPACE FILLER. PLACE THE FLASHING BETWEEN THE BOTTOM OF THE BEAMS AND THE FOAM BOARD. MAKE SURE THE LENGTH OF THE FLASHING EXTENDS BEYOND THE OUTSIDE OF THE BRIDGE BEAMS. FINALLY, TRIM THE FLASHING SO THAT IT FITS AGAINST THE PARAPETS.

**SCENE 26:**

PLACEMENT OF THE SUPERSTRUCTURE OCCURS FOLLOWING CONSTRUCTION OF THE BEAM SEAT AND FLASHING INSTALLATION. MAKE SURE TO SET THE BEAMS SO THEY ARE SQUARE AND LEVEL. NEVER DRAG THE BEAMS OVER THE BEAM SEAT SURFACE.

**SCENE 27:**

THE WINGWALLS AND PARAPET ARE CONSTRUCTED FOLLOWING PLACEMENT OF THE SUPERSTRUCTURE. FIRST, TRIM THE SPLIT-FACED CONCRETE MASONRY UNIT IN THE PARAPET WALL FOR A CUSTOM FIT AGAINST THE BEAM EDGE. NEXT, FILL THE SPACE BETWEEN THE SUPERSTRUCTURE AND THE FACING BLOCK WITH THIN LAYERS OF CUT BLOCK OR MORTAR MIX. FOLLOWING COMPLETION OF THIS PHASE, APPROACH CONSTRUCTION CAN BEGIN.

**SCENE 28:**

THE G-R-S INTEGRATED APPROACH IS CONSTRUCTED OF AGGREGATE LAYERS, REINFORCED AND WRAPPED WITH GEOTEXTILE THAT BLENDS THE APPROACH WAY TO THE BRIDGE DECK TO CREATE A SMOOTH TRANSITION. IT IS IMPORTANT TO USE WELL GRADED MATERIAL THROUGHOUT THIS PHASE AND TO TRIM THE GEOTEXTILE REINFORCEMENT TO THE PRESCRIBED LENGTH AFTER IT IS WRAPPED.

REPEAT THIS PROCESS UNTIL REACHING A HEIGHT APPROXIMATELY 2 INCHES FROM THE TOP OF THE BEAM GRADE. THE WRAPPED LAYERS ARE THEN PLACED BEHIND THE BEAM END.

**SCENE 29:**

THERE ARE A FEW GUIDELINES TO FOLLOW FOR PAVEMENT OF A G-R-S PROJECT. FIRST, DURING PAVING, IT IS IMPORTANT TO KEEP THE TOP LAYER OF REINFORCEMENT APPROXIMATELY 2 INCHES BELOW THE BEAM GRADE. THIS WILL ALLOW A LAYER OF AGGREGATE COVER TO BE PLACED TO PROTECT THE GEOTEXTILE REINFORCEMENT FROM CONTACT WITH HOT MIX ASPHALT. ALSO, THE PAVING FABRIC SHOULD EXTEND 3 FEET OVER THE BRIDGE DECK ONTO THE APPROACH. FINALLY, IF GUARD RAIL INSTALLATION IS PART OF THE PROJECT DESIGN, IT IS RECOMMENDED TO USE STEEL “H” POSTS FOR ANY RAILING THAT IS DRIVEN THROUGH THE REINFORCEMENT. IT IS ALSO POSSIBLE TO DRILL THROUGH G-R-S WITH AN AUGER TO SET OTHER TYPES OF POSTS.

**SCENE 30:**

THESE PROCEDURES FOR CONSTRUCTING A G-R-S I-B-S HAVE BEEN PROVEN IN THE FIELD TO FACILITATE QUICK AND EFFICIENT CONSTRUCTION. ADDITIONALLY, G-R-S I-B-S PROVIDES FASTER PROJECT COMPLETION AT A REDUCED COST BECAUSE THE DESIGN IS FLEXIBLE AND THEREFORE EASILY MODIFIED IN THE FIELD.

**SCENE 31:**

THE BIGGEST BENEFIT TO THE G-R-S I-B-S SYSTEM IS THE ADAPTABILITY TO THE DIFFERENT SITES AND THEN THE OVER EXCAVATION THAT IS NOT REQUIRED AS PART OF THIS. WE CAN PUT IT ON UNSUITABLE SOILS; WE CAN PUT IT IN WATER ENVIRONMENTS WHERE WE WOULD NORMALLY HAVE TO HAVE PILES FOR STANDING CONCRETE. OBVIOUSLY, IT’S CHEAPER, IT’S FASTER AND IN THESE ECONOMIC TIMES THAT WE’RE IN NOW, CHEAPER AND FASTER IS OBVIOUSLY A BIG FACTOR.

**SCENE 32:**

IT’S NOT TRADITIONAL, SO TO LOOK AT IT FROM THE OUTSIDE, YOU MIGHT QUESTION IT. BUT ONCE THE CONSTRUCTION PROCESS STARTS, YOU CAN QUICKLY SEE HOW EASY THE CONCEPT IS AND HOW FLEXIBLE YOU CAN BE IN TIMES OF CONSTRUCTION, WITH RAIN, WEATHER; IT DOESN’T REALLY SHUT ANYTHING DOWN IN TERMS OF MOVING THE CONSTRUCTION PROCESS ALONG.

**SCENE 33:**

THERE ARE THREE PRIMARY ADVANTAGES FOR USING THE G-R-S I-B-S. IT’S FASTER, MORE ECONOMICAL, AND EASIER TO BUILD THAN TRADITIONAL BRIDGE STRUCTURES. ADDITIONALLY, RESEARCH INDICATES THAT ITS LONG-TERM DURABILITY WILL BE BETTER BECAUSE IT HAS FEWER PARTS AND BECAUSE THE SUBSTRUCTURE AND SUPERSTRUCTURE ARE BLENDED WITH THE APPROACH WAY TO CREATE A JOINTLESS BRIDGE SYSTEM.

THE G-R-S I-B-S SYSTEM DOESN'T HAVE MANY OF THE COMMON ELEMENTS ASSOCIATED WITH A TRADITIONAL BRIDGE, PARTICULARLY THOSE LEADING FROM THE ROADWAY TO THE BRIDGE. FOR EXAMPLE, IT DOESN'T HAVE AN APPROACH SLAB OR A SLEEPER SLAB, AND IT ELIMINATES THE BRIDGE BEARINGS.

**SCENE 34:**

G-R-S I-B-S IS NOT FOR EVERY BRIDGE BUILDING ASSIGNMENT. IT IS, HOWEVER, A PERFECT SOLUTION FOR SMALLER, SINGLE-SPAN BRIDGES. THE SYSTEM IS CURRENTLY TAILORED FOR SINGLE-SPAN BRIDGES UP TO 140 FEET. THE LONGEST BRIDGE CONSTRUCTED TO DATE IS A 140 FOOT STEEL GIRDER BRIDGE. THAT BRIDGE IS PERFORMING VERY WELL. EVEN THROUGHOUT ITS THERMAL CYCLES, THERE HAVE BEEN NO ADVERSE EFFECTS SEEN ON THE APPROACH WAY.

G-R-S I-B-S IS GREAT FOR GRADE SEPARATIONS, ALTHOUGH THE BRIDGES COMPLETED TO DATE ARE BUILT OVER STREAMS WITH NON-SCOUR CONDITIONS. IT IS A SHALLOW FOUNDATION SYSTEM AND THUS NOT SUITABLE FOR SCOUR CRITICAL AREAS. HOWEVER, THE TECHNOLOGY WORKS VERY WELL FOR BOTH STEEL AND CONCRETE SUPERSTRUCTURES.

**SCENE 35:**

IN DEFIANCE COUNTY, THE FIRST BRIDGES BUILT USING THE G-R-S I-B-S PROVIDED THEM WITH A 21 PERCENT COST SAVINGS. TODAY, DEFIANCE COUNTY IS SAVING UP TO 40 PERCENT ON THEIR BRIDGES BECAUSE OF THEIR ABILITY TO RAPIDLY CONSTRUCT THE SUBSTRUCTURE. THEY UNDERSTAND HOW THE TECHNOLOGY WORKS AND THE LABOR CREW IS WELL-TRAINED.

IN SAINT LAWRENCE COUNTY, THEIR SAVINGS ARE EVEN GREATER BECAUSE IN THEIR PREVIOUS DESIGN METHODOLOGY THEY INCLUDE MANY OF THE DETAILS ASSOCIATED WITH A TRADITIONAL BRIDGE, SUCH AS THE APPROACH SLAB, THE SLEEPER SLAB, THE BRIDGE BEARINGS, AND THE PARAPETS. WITH THE I-B-S YOU DON'T NEED THESE TRADITIONAL ELEMENTS. SAINT LAWRENCE COUNTY HAS REALIZED A SAVINGS OF BETWEEN 50 TO 60 PERCENT ON ALL THE BRIDGES THEY ARE CURRENTLY BUILDING.

**SCENE 36:**

RECENTLY, THE *INTERIM IMPLEMENTATION GUIDE FOR THE GRS-IBS* WAS COMPLETED. THIS GUIDE IS THE RESULT OF ABOUT 40 YEARS OF RESEARCH. IT CONSISTS OF TWO VOLUMES. ONE SPECIFICALLY FOR THE DESIGN AND CONSTRUCTION OF THE G-R-S I-B-S; THE OTHER VOLUME CONTAINS A CENSUS REPORT OF ALL THE AVAILABLE RESEARCH SUPPORTING THE DESIGN AND CONSTRUCTION OF THE G-R-S I-B-S.

**SCENE 37:**

FOR OTHERS THINKING ABOUT G-R-S, THE THING TO DO FIRST IS KIND OF GET COMFORTABLE WITH IT IN TERMS OF HOW IT WORKS. UNDERSTAND THE FACT THAT THERE IS A LOT OF DATA THAT SHOWS THAT YOU CAN TRUST IT. IF YOU PUT IT TOGETHER THIS WAY, YOU'LL GET THE KIND OF PERFORMANCE THAT WE'VE SEEN. AND THEN TO GET COMFORTABLE WITH THE ACTUAL CONSTRUCTION. IT'S BEEN A GOOD FIT FOR US.

**SCENE 38:**

I CAN QUITE SINCERELY SAY THAT FROM THE BEGINNING OF RESEARCHING THIS TECHNOLOGY IT HAS AMAZED ME WITH EACH EXPERIMENT. IT HAS EXCEEDED OUR EXPECTATIONS, AND WHEN WE BUILT THE I-B-S, DESIGNED THE I-B-S, WE REDESIGNED THE BRIDGE WHERE WE GOT RID OF ALL THE COMMON ELEMENTS ASSOCIATED WITH THE BRIDGE AND REDESIGNED IT FROM THE BOTTOM-UP. I THINK IT CAN BE USED ON THE INTERSTATE SYSTEM, ONCE PEOPLE TAKE MORE NOTICE OF ITS LONG-TERM

PERFORMANCE ON THESE LOCAL ROAD SYSTEMS. I TRULY BELIEVE THAT THE TECHNOLOGY HAS A HOME IN ALL FACETS OF EARTHWORK, NOT JUST IN BRIDGE SUPPORT APPLICATIONS.

**SCENE 39:**

THE MANY ADVANTAGES G-R-S I-B-S TECHNOLOGY OFFERS MAKE IT A VIABLE CHOICE FOR MANY BRIDGE PROJECTS.