5. *CDOT Procedural Directive 548.1, Safety Considerations on Resurfacing and 3R Type Projects*

7.10 PROCEDURES FOR ADDRESSING SAFETY REQUIREMENTS ON RESURFACING, RESTORATION, REHABILITATION (3R) PROJECTS

7.10.1 Purpose of 3R Program

The purpose of the 3R program is to preserve and extend the service life of highways and enhance highway safety. 3R projects enable highway agencies to improve highway safety by strategically upgrading existing highway and roadside features without the cost of upgrading to current AASHTO design standards. It is CDOT's objective to maximize accident reduction on 3R projects within the limitations of available budgets and to be consistent with the intent of the 3R policy by making road safety improvements at locations where it does the most good and prevents the most accidents. The following procedures are intended to develop a more safety conscious design leading to enhanced safety statewide by taking advantage of cost effective opportunities to improve safety.

7.10.2 3R Policy (See CDOT Policy Directive 548.0)

The purpose of the 3R program is to preserve and enhance the existing service life of highways and enhance highway safety. It is the Policy of the State of Colorado, and the Colorado Department of Transportation (CDOT) to have a systematic safety evaluation process that assures adequate and meaningful safety considerations and ultimately the implementation of these safety improvements when warranted on 3R projects.

Further, it is CDOT's objective to maximize accident reduction on 3R projects within the limitations of available budgets and consistent with project scope by making road safety improvements at locations where it does the most good and prevents the most accidents.

It is to this end, and is the purpose of this Policy, to assure that investment in safety improvements within 3R projects will be made when justified and economically feasible.

7.10.3 3R (Resurfacing, Restoration, and Rehabilitation):

A 3R project is any project which consists of one or more of the following: resurfacing, restoration, or rehabilitation.

Resurfacing: Placement of additional surfacing material (1.5 to 6 inches thick) over the existing roadway to improve serviceability and/or to provide additional strength.

Restoration and Rehabilitation:

- Work required to restore the existing pavement (including shoulders) to a condition of adequate structural support or to a condition adequate for placement of an additional stage of construction.
- Work required to widen the lanes and/or shoulders of an existing facility.
- Adding Acceleration/Deceleration, turn, short climbing lanes, etc., but not through lanes.

- Work required to correct minor structure safety defects or deficiencies (See Section 7.10.4.6).

4R (Resurfacing, Restoration, Rehabilitation and Reconstruction): Projects requiring reconstruction or resurfacing greater than six inches should not follow the 3R procedures because AASHTO design standards apply and design variances are required when the design does not meet relevant standards.

Maintenance Project: Maintenance type projects with a resurfacing depth greater than or equal to 1.5 inches will follow these 3R procedures. Maintenance type projects that are less then 1.5 inches do not fall under 3R procedures.

Safety Project: Safety projects do not fall under 3R procedures because this type of project addresses a specific safety deficiency.

7.10.4 3R Design Procedures

7.10.4.1 Design Scoping Review

The Design Scoping Review (DSR) creates an early office study and on-site review of a project prior to preliminary design. The project team should evaluate safety with the knowledge of what improvements to the project yield the greatest safety gains in relation to cost. This enables the development of a scope of work that will be consistent with CDOT's 3R policy. See Section 8.09 (DSR) and Procedural Directive 512.1 for further requirements. This review should be used to identify and document potential safety improvements.

When a project falls under 3R procedures, the Region Project Team in charge of the project (Designer, Resident Engineer, Project Engineer, or Traffic Engineer) can get an initial idea of the level of possible safety work needed as related to accident history by referring to a map provided by the HQ Safety and Traffic Engineering Branch identifying "Locations with Potential for Accident Reduction". These "Location Maps" identify intersections (Yellow Dots) and highway segments (Colored Lines Parallel to the Highway) on the State Highway System where specific accident patterns are observed and can possibly be addressed. If an accident pattern exists within the project limits, the Project Team should then refer to the accompanying "Listing". This listing specifically identifies each location by Highway and Milepoint. Both the Maps and Listings (in PDF format) are located on the HQ Safety and Traffic Engineering's Website at:

http://internal/stafftraffic/safety_engineering_group/accident_reduction_locations.html

7.10.4.2 Safety Evaluation

A Safety Evaluation performed by the HQ Safety and Traffic Engineering Branch should be done for all projects and will result in either a Traffic Operational Analysis (TOA) or Safety Assessment Report (SAR). The Project Manager will contact the HQ Safety and Traffic Engineering Branch to request a Safety Evaluation. This can be requested through the HQ Safety and Traffic Engineering Website. This Branch will determine the level of analysis required and will provide the Project Manager either a TOA or a SAR. A TOA is an accident history report with a brief recommendation section. A SAR is a comprehensive analysis of the accident history, can take up to 6 months to complete, and will include specific recommendations. The Project Team should start the Safety Evaluation process at the earliest possible stages of the project (DSR or earlier), so that if recommendations are made in the Safety Evaluation, there will be enough time to incorporate those recommendations into the project plans.

If a Safety Evaluation (TOA or SAR) is not obtained, these 3R procedures do not apply. The project team must evaluate all 13 geometric design criteria for the entire project and complete design exception variance requests in accordance with Section 1.10.

7.10.4.3 Field Inspection Review/Final Office Review (FIR/FOR)

FIR/FOR reviews shall be conducted in accordance with the procedures outlined in Sections 8.10 and 8.12.

7.10.4.4 Safety Issues Related to Geometric Design Criteria

The designer will adhere to the following procedures for designing and documenting the 13 geometric design criteria (Design Standards, Boxes 3 and 4 of CDOT Form 463 and CDOT Form 1327). For definitions of the 13 geometric design criteria, see the CDOT Design Guide. For Freeway and Interstate 3R projects, full AASHTO standards apply. For the purposes of these procedures, Freeways are arterial highways with full control of access (for further information see “AASHTO A Policy on Geometric Design of Highways and Streets” and the CDOT Transportation Data Set http://www.dot.state.co.us/App_DTD_DataAccess/index.cfm). For all other 3R projects, the 3R standards are intended to provide reduced limits in design. However, these lesser standards should not be used automatically, but only if higher values are not possible, practical or cost effective (See Section on 3R standards in the CDOT Design Guide for these standards).

The project team should address all documented safety issues as identified through the Safety Evaluation, DSR, FIR, and FOR processes. Existing roadway design features may be retained where they are performing in a satisfactory manner with regard to accident history. The proposed design should not worsen an existing condition (guardrail height, edge drop-off, drainage, etc.). Safety issues identified as being related to any of the 13 geometric design criteria will be addressed in the design process. Only those geometric design criteria directly related to the identified safety issue need to be addressed. Refer to the “Process for Addressing Safety Requirements on 3R Projects” flowchart (Exhibit 1) for guidance.

If a geometric design criterion is identified as being related to accident causality, then the designer will either bring this design element up to the relevant standard, or will complete a design variance according to the procedures as described in Section 1.10 – Design Exception (Variance) (Form 464) and the process flowchart (Exhibit 1). (Design variances for Interstate projects require FHWA approval.)

All existing guardrail, bridge rail and transitions not meeting NCHRP 230 and end anchorage and median terminals not meeting NCHRP 350 shall be upgraded to meet NCHRP 350 requirements unless the Program Engineer waives this requirement in writing. For assistance contact the Standards and Specifications Unit and Staff Bridge.
The Project Manager may implement safety improvements not specifically identified in the Safety Evaluation, DSR, FIR and FOR if funding and special circumstances exist and written approval is obtained from the Program Engineer.

7.10.4.5 Safety Issues Not Related to One of the 13 Geometric Design Criteria

Safety mitigation recommendations identified through the Safety Evaluation, DSR, FIR, and FOR processes that are not related to one of the 13 geometric design criteria should be incorporated into the plans. If the decision is made not to implement recommendations for improvement, this decision should be documented in the meeting minutes or explained in a design decision letter.

7.10.4.6 Structural Recommendations for Overlay Work

The Project Manager will contact the appropriate Regional Staff Bridge Unit for recommendations concerning Structural Capacity and Bridge Width for all structures within the project limits.

7.10.4.7 Completion of the Preliminary Design Data (Form 463)

Project Managers must complete a Form 463 in accordance with Section 1.09.

7.10.4.8 Resurfacing Program Funding Limitations

The Colorado Transportation Commission determines the level of funding for the Surface Treatment Program with the goal of maintaining the condition and drive-ability of the state highway system. CDOT's surface treatment program restricts the type of work eligible for this funding. Minor safety work (signing, striping, delineation etc.), shoulder-up work, guardrail adjustments, and Americans with Disabilities Act requirements necessary to complete the surface treatment, are allowed under this program. The Project Manager should refer to Policy Memo 007 dated January 2002, "Analysis of Surface Treatment Budgets and Essential Costs" for guidance on allowable items. This policy memo is available on the CDOT Website: http://www.dot.state.co.us/DesignSupport/.

Enhancements that are deemed desirable or that are mandated (upgraded bridge rail and guardrail, permanent stormwater quality features, etc.) can also be implemented, but funding other than resurfacing would have to be provided to supplement the budget.

7.10.4.9 Safety Enhancement Funding

Safety enhancements not allowed under the resurfacing program can be funded through the Region - Safety Enhancements Pool. The Project Manager will submit these requests to the Program Engineer detailing proposed work, reasons for the safety enhancement and estimated costs listed by appropriate work items. The Region will prioritize these requests and allocate funds based on the system-wide goal of achieving the maximum reduction of accidents within budgetary allocations. The Region Program Engineer and/or the Region Traffic Engineer will decide which safety enhancements will be funded in the Region. If budgetary limitations prohibit the funding of all requested safety enhancements, the Program Engineer will document the decision to not fund the safety enhancement and will submit a copy to the Project Manager. The Project Manager will then complete the appropriate documentation. Refer to the "Process for Addressing Safety Requirements on 3R Projects" flowchart (Exhibit 1) for guidance.

Attachment Process for Addressing Safety Requirements on 3R Projects Flowchart (Exhibit 1)

C:\Project Development\Commit

3R Flowchart (Rev 022306)

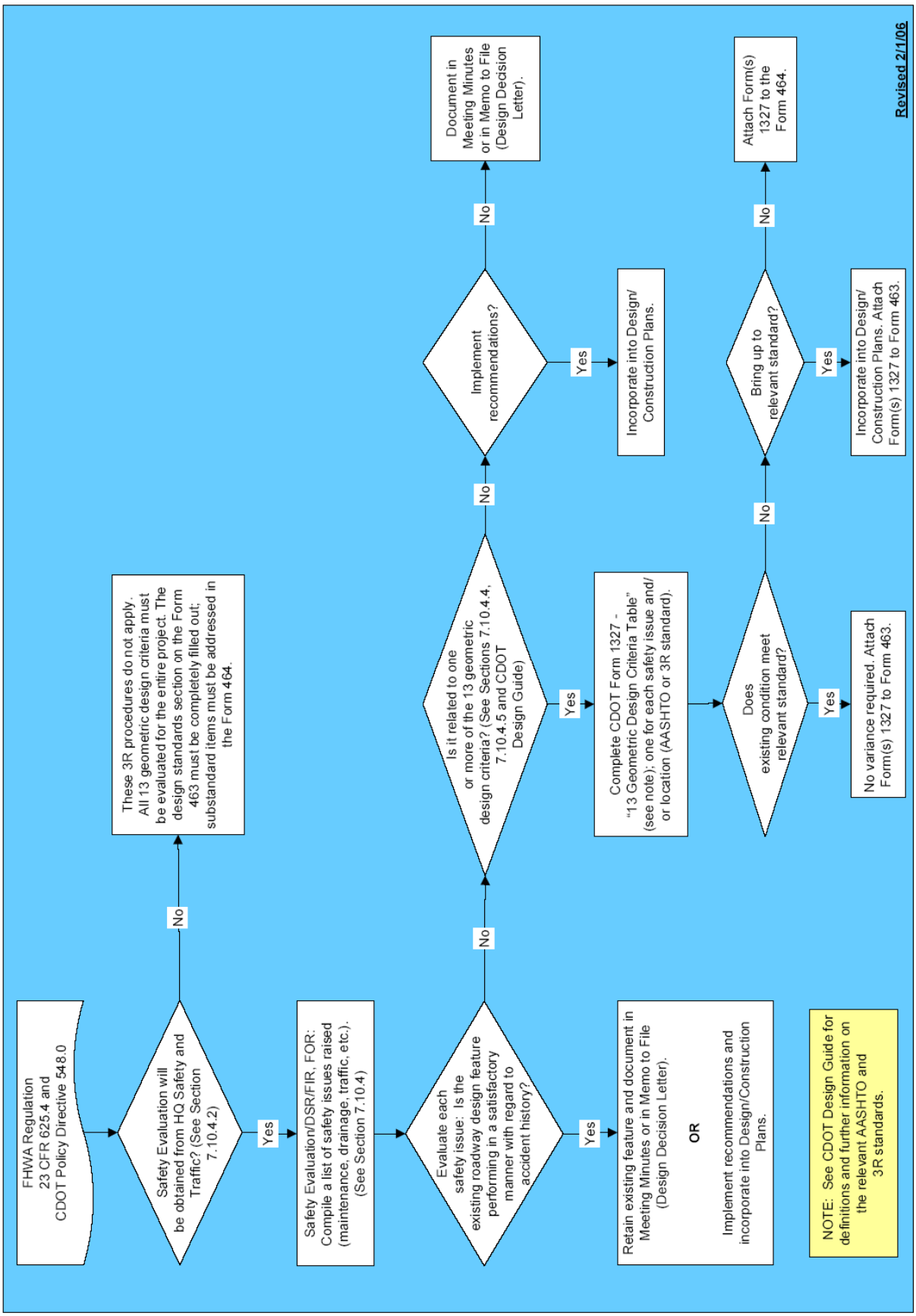
Attachment Example 464 for a 3R Project

Example 3R cdot0464.doc

EXHIBIT 1

PROCESS FOR ADDRESSING SAFETY REQUIREMENTS ON 3R (RESURFACING, RESTORATION, REHABILITATION) PROJECTS

(Applicable to all 3R projects regardless of funding.)



COLORADO DEPARTMENT OF TRANSPORTATION **DESIGN EXCEPTION VARIANCE REQUEST**	FHWA Oversight ☐ Yes ☒ No	Project Code
Project name	Date	Project Number
Type (check all that are applicable) ☐ New construction ☐ Restoration ☒ Resurfacing ☐ Rehabilitation ☐ _____ ☐ Reconstruction ☒ Safety ☐ Enhancement ☐ _____ ☐ _____	Revised	Region

Part 1 – Complete A through H for all projects.

A. Short project description (☒ see CDOT Form 463 for more detailed description)	☐ AASHTO standards apply ☒ 3R standards apply ☐ Other:_____
B. Description of standard(s) reduced	
C. Rational need for exception(s)	
D. Mitigation measures proposed (include safety discussion)	
E. Description of adjoining sections: (☒ see CDOT Form 463) Other:	☒ same as existing project ☒ same as proposed project

F. Accident data Source: Most recent statewide accident rate (calendar year) for this functional class / facility: (per million vehicle-miles of travel) a) _____ b) _____ Latest accident rate for this highway (usually 3 years): _____ a) _____ b) _____	G. Cost Estimated item cost if built to full standard $ _____ Estimated item cost with exception $ _____ ± difference in cost: $ _____
H. Other (as needed)	

Part 2 – Appropriate signatures required.

A. Submitted by (Project Manager)	Date	Program Engineer Approval	Date
Resident Engineer Approval			Date

Required for Federal-oversight projects only

Approved by (FHWA Division Administrator)	Date
B. ☐ Not approved ☐ Approved with conditions	Conditions/comments

Previous editions are obsolete and may not be used.

Distribution: Project Manager
Program Engineer
Resident Engineer
HQ Records Center
FHWA, if applicable

CDOT Form #0464 08/04

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7.11 GUARDRAIL / BARRIER DESIGN AND REVIEW

Guardrail or concrete barrier is installed to reduce the severity of run-off-the-road accidents at warranted locations. The primary purpose of guardrail/barrier is to prevent a vehicle from leaving the road and striking a fixed object or terrain feature that is more hazardous than guardrail.

A guardrail and/or barrier is a longitudinal barrier used to shield motorists from natural or manmade hazards located along either side of a roadway, and may occasionally be used to protect bystanders, pedestrians and cyclists from vehicular traffic. Guardrail is installed when an obstacle cannot be removed or relocated or when the steepness of the roadside terrain prevents adequate clear zone. CDOT desires to install guardrail only when it is not economically feasible to eliminate a hazard, make the feature transversable, or terrain conditions are such that an adequate roadside recovery area cannot be provided for the given design speed.

In many cases, slope flattening and extending hazardous features such as culverts can be viable option to guardrail. Guardrail (semi-rigid) and concrete (rigid) barriers can redirect errant vehicles when impacted. Semi-rigid barriers can deflect up to 3 feet upon impact. Rigid concrete barrier has no deflection upon impact.

Because guardrail is a hazard in itself, it should be installed only per the guidelines of the *AASHTO Roadside Design Guide.* Placement of guardrail and barrier is based on accident potential and severity. Since both guardrail and concrete barrier are hazards, installation of these devices must result in a reduction in the accident severity compared to impacting the hazard being shielded.

Substandard bridge rail should be examined for upgrading on projects, including resurfacing when feasible.

The Resident Engineer is responsible for evaluating factors concerning safety, traffic control, hazards and other constraints in the use of guardrail. Justifications and warrants for guardrail design are best done after the scoping review. The Resident Engineer should use an analysis to warrant the use of guardrail based on the *AASHTO Roadside Design Guide*. Bridge rail designs and decision should be coordinated with Bridge Design and Management Branch.

The Resident Engineer should consider factors such as design speed and traffic volume in relation to barrier need as identified in the *AASHTO Roadside Design Guide*. The cost of slope flattening and hazard elimination versus guardrail cost should be considered.

The design sequence for the placement of guardrail is as follows: