



COLORADO

Department of
Transportation

Region Four - Loveland Residency

2207 East Hwy 402

Loveland, Colorado 80537

I-25 S/O SH 56 Climbing Lane, Construction Administration
SCOPE OF WORK

November 23, 2015
Region 4

PROJECT NUMBER: IM 0253-243

PROJECT CODE: 20583

CMS ID NUMBER:

PROJECT LOCATION: I-25 South of SH 56, Southbound Climbing Lane, Weld County, Colorado

CONTRACT TYPE: Project Specific

CONTRACT SUBJECT: Construction Management, Inspection and Testing Services

The Contract Administrator for this Contract will be:

James Flohr, Resident Engineer
Region 4, Loveland Residency

Office: (970) 350-2134

Active Day to Day administration and monitoring of this contract will be delegated to the following CDOT employee:

Tim Tuttle, Project Manager
Region 4, Loveland Residency

Office: (970) 350-2139

General Scope of Work

The scope of work is for project management, inspection, and material testing services of the I-25 South of SH56 Climbing Lane. The Project is located on southbound I-25 south of SH 56 for approximately 3 miles in Weld County.

During Construction, CDOT anticipates utilizing approximately:

- 1 Consultant Project Engineer
- 1 Consultant Inspectors
- 2 Consultant Materials Testing Technicians (with ability to perform inspections preferred)

The Project Engineer will be responsible for the day to day responsibilities and duties associated with CDOT contract administration. These responsibilities and duties include supervision of project staff, verbal and written correspondence with the Prime and Sub-Contractors, inspection of materials and methods of construction to verify compliance with CDOT and contract specifications, preparing monthly pay estimates, reviewing and approving Methods of Handling Traffic (MHT's), monitoring the project schedule and financial status, reviewing certified payrolls, resolving material and traffic control issues, and coordination/contact with local entities and business with respect to construction activities.

The inspector(s) will be responsible for day to day activities as assigned by the Project Engineer. These responsibilities may include documentation and inspection of construction activities, supervision and documentation of time and material work, and preparation of daily diaries documenting contractor activities and relevant observations.

The material testers will be responsible for materials sampling, testing, documentation and project inspection as required and as directed by the Project Engineer.

Definitions

CDOT Resident Engineer - The CDOT Resident Engineer is responsible to the Region Program Engineer for the quality and successful completion of a transportation project. The Resident Engineer authorizes interim and final payments and all changes to Contracts for all Consultants and Contractors.

CDOT Project Engineer - The CDOT employee assigned by the Resident Engineer to manage the day to day administration of this contract. The CDOT Project Engineer may or may not be on the project site full-time.

Consultant - The firm or corporation providing personnel under this agreement to perform construction services as outlined herein.

Consultant Project Engineer - The Consultant employee assigned by the Resident Engineer to be the Chief Engineer's duly authorized representative. The Consultant Project Engineer is in direct charge of the project work and is responsible for the administration and satisfactory completion of the project under contract. The Consultant Project Engineer will be a licensed Professional Engineer registered in the State of Colorado.

Consultant Inspector or Materials Testing Technician (MTT) - Consultant employee who performs construction materials-testing services, construction inspection, and other project-related services under the responsible charge of the Consultant Project Engineer, and at the direction of the CDOT Resident Engineer.

CDOT Inspector or Materials Testing Technician (MTT) - CDOT employee who performs construction materials testing services, construction inspection, and other project-related services under the responsible charge of the Consultant Project Engineer, and at the direction of the CDOT Resident Engineer.

Contractor - The individual, firm, or corporation contracting with CDOT to construct a transportation project.

Work Duration

The time period for the work described in this scope of work covers the period from approximately January 2016 to January 2017. Construction is anticipated from approximately early March 2016 to November 2016. Project submittals and meetings, such as schedule, methods statements, and pre-construction and partnering meetings, are expected to begin a few weeks before construction begins. The Consultant Project Engineer is expected to coordinate, attend and review this work. The full-time Project Engineer will be required when construction activities commence. Work may be required at night and/or day, on weekends, holidays and/or on a split-shift basis. Work weeks may be in excess of or less than the standard 40-hour week.

Conditions Applicable to all Consultant Personnel: Overtime/Travel Pay/Commute Miles/Per Diem

Overtime hours will be paid by CDOT at the same rate as regular, non-overtime hours. Travel time will be paid (limited to one hour per day or actual commute time, whichever is less). Commuting mileage (limited to 100 miles per day or actual round-trip commuting distance, whichever is less), will be paid.

Authorization to Proceed

Work shall not commence until the written Notice to Proceed is received by the consultant, and shall be completed in the time specified

Routine Billing & Reporting

The Consultant shall provide the following on a regular basis:

- 1) Monthly billing formats, suitable to the Consultant Project Engineer and CDOT Resident Engineer, for all contract activities performed by the Inspection Consultant.
- 2) Periodic reports and billings required by CDOT Procedural Directive 400.2.
- 3) Weekly time cards for consultant personnel. The Consultant Project Engineer, prior to billing, must sign these time cards.

The consultant shall bear all costs related to delay of construction when the Consultant fails to provide qualified personnel when required. The Consultant's monthly payments may be withheld for that portion of the work for which the consultant personnel fail to provide accurate and timely reporting.

Status of Contract

The consultant shall monitor the fiscal status of the contract, and advise the CDOT Project Engineer of any potential need to supplement their contract. Failure to monitor contract status and provide timely notification may result in discontinuation of the Consultant's services.

Project Standards

All documentation shall be in accordance with the latest versions of the Colorado Department of Transportation's Construction Manual, Field Materials Manual, CDOT Laboratory Manual of Test Procedures, Colorado Department of Transportation Inspector's Checklist, Standard Specifications for Road and Bridge Construction, the Supplemental Specifications, applicable M & S standards, and the plans and specifications currently in use when the construction project is advertised or revised under advertisement.

References to "the specifications" shall include all applicable CDOT Standard Specifications for Road and Bridge Construction including Supplemental Specifications, Project Standard Revisions and Project Special Provisions, and project plans and specifications.

Proposed work procedures shall be coordinated with the Project Engineer and Resident Engineer prior to the start of work.

Labor, Materials, Vehicles & Equipment

The Consultant shall furnish all personnel, equipment and transportation required to perform the work. Consultant personnel shall have appropriate vehicles (equipped with flashing amber beacon), cell phone, computers, and miscellaneous equipment (calculator, office and lab supplies, safety equipment, etc.) required for performing the work.

Each consultant staff shall be supplied with a state of the art computer w/modem (phone, ISDN or cable as required) and wireless aircard, a writeable CD drive, a color printer (that can be networked for all staff or black/white for other staff), a scanner (capable of scanning

11"x17" sheets), and loaded with the most current version of MS Office software (& Site Manager or QA/QC program if applicable).

The Consultant shall have digital cameras available to staff at all times and document the project accordingly submitting CD's with relevant photos to the CDOT Resident Engineer on a regular basis.

Personnel qualifications, staffing level, and number and types of vehicles shall be subject to the approval of the Resident Engineer. The Consultant shall assign personnel for the duration of the project unless otherwise approved by the CDOT Project Engineer.

The following equipment shall be furnished by the consultant tester for each project in sufficient quantity and in good working order (with current calibration) to ensure accurate performance of all work required in a timely manner:

- Nuclear Asphalt Content Gauge
- Nuclear Moisture-Density Gauge
- Concrete air meter, slump cone, and other concrete testing equipment.
- Sieves for aggregates and soil gradations
- Electronic scales
- Asphalt & A/C sample containers and small tools
- Proctor equipment for soil curves and one point tests
- Atterburg, Rice value, and Sand Equivalent equipment
- Sample drying equipment
- Concrete cylinder molds which meet AASHTO requirements except that paper molds shall not be used, and plastic molds shall not be reused
- Miscellaneous equipment for performing the required soils, asphalt and concrete tests

Engineer's Certification

The CDOT Resident Engineer shall be the final authority regarding acceptance of work performed by the Consultant. The CDOT Resident Engineer shall be the final authority regarding acceptance of work not conforming to the plans and specifications.

The Consultant Project Engineer shall certify in writing that all inspection and Construction Management conforms to the plans, specifications, and purpose of design.

The Consultant Professional Engineer shall be available during construction and will be utilized as needed to provide engineering guidance and oversight of the Consultant's employees. The number and types of personnel may be adjusted up or down to meet project workload and Contractor's schedule.

The Consultant Project Engineer shall meet with the CDOT Project Engineer if it is anticipated that Consultant services may not be required for a period exceeding one week. A procedure shall be agreed upon at the Initial Project Meeting to address this issue.

Work Description

Construction Administration Services

Task 1.0 Construction Management Support

Provide CDOT Project Engineer with the following construction management and inspection support.

- 1.1 Construction Coordination: Regularly scheduled weekly and as-needed meetings will be conducted with the Contractor and other involved parties to review, update, and coordinate construction activities. Weekly meetings will include a review of issues that are impacting progress, the cost to complete the work, and significant situations encountered related to the construction of the project. Meeting minutes will be prepared to document items discussed, decisions reached, direction given, and actions to be taken.
- 1.2 Review of Contractor's Method of Handling Traffic: Review and approve the Contractor's Method(s) of Handling Traffic (MHT) submittals. During construction, monitor the Contractor's MHT for implementation of traffic signing, barriers, and other traffic control measures in accordance with the approved plan.
- 1.3 Review of Construction for Conformance with Plans and Specifications: Monitor the Contractor's construction activities with respect to the contract documents and relevant schedule submittals governing the performance of the work. Resolve construction problems and/or recommend action for their resolution, as they relate to changed field conditions or conflicts in the contract documents. Coordinate with the designer during construction for implementation of revisions to the plans as may be required.
- 1.4 Review of Progress Schedules & Processing Shop/Working Drawings Submitted by the Contractor: Schedule submittals shall be thoroughly reviewed for completeness and accuracy. Appropriate action shall be taken when deficiencies are noted.

Submittals, design drawings, shop drawings, materials, and test procedures received from the Contractor will be forwarded to appropriate CDOT design personnel for review and approval. Approved drawings will be returned to the Contractor, as well as a copy retained for use during the remainder of the project.

- 1.5 Daily Quality Control Inspection & Quantity Control: Perform daily quality control inspections of construction activities to document activities performed and assessment of conformance with the contract documents in accordance with Section 2 of this Scope. Inspection items may include but are not limited

to excavation, backfill, and compaction operations; concrete placement; paving; drainage; utilities; structures; signing and striping; landscaping; and traffic control installations.

Quantities of work elements constructed will be measured and recorded to support the preparation and processing of progress pay estimates to the Contractor. Quantities will be documented in an interim quantity book for tracking of quantities constructed as compared to the original design quantities on the project. Quantities of work will be agreed upon with the Contractor and then reflected in monthly progress pay estimates prepared by the Consultant's staff. Assist CDOT in resolving disputes in quantities with the Contractor prior to the preparation of the pay estimate.

- 1.6 Materials Testing: Direct, coordinate, supervise, monitor, manage and administer all materials sampling and testing to ensure that the required sampling, materials testing and documentation is obtained in a timely manner and maintained in accordance with the Materials Manual and Contract requirements to verify the quality of the work performed by the construction contractor.
- 1.7 Project Documentation: Maintain project submittal register, track project correspondence, check daily diaries, prepare inspectors progress reports, and complete appropriate CDOT paperwork and forms.
- 1.8 Contaminated Material Notification: Monitor construction operations and notify the CDOT Project Engineer immediately when contaminated material is encountered or developed on the project. When such material is identified, procedures developed by the Contractor to mitigate the problem will be reviewed and a recommendation provided.
- 1.9 Check Surveying: Provide quality control surveying and quantity verification as needed. (If the Contract includes a Construction Surveying pay item, then the Contractor is responsible for performing all surveying required to properly layout and construct the work covered under the Contract.)

Task 2.0 Post Construction Support

- 2.1 Completion, Inspection and Punch List: Conduct a final inspection with the Contractor, CDOT Resident Engineer, CDOT Project Engineer, and CDOT Maintenance representative(s) upon substantial completion. The result of the inspection is the development of a punch list of remaining and/or outstanding work to be performed by the Contractor prior to final project acceptance.
- 2.2 As-Constructed Drawings: Complete as-constructed drawings of work completed by the Contractor including final pay quantities.

2.3 Completion Inspection and Close-Out: Following the completion of all punch list items by the Contractor, conduct a final inspection with representatives from the Contractor and CDOT, to confirm the completion of all work. The result of this inspection will constitute final project acceptance.

2.4 Preparation of Final Pay Estimate: Determine final quantities with appropriate supporting documentation and checks and prepare final pay estimate.

Task 3.0 Project Management

3.1 Progress Reports: Prepare monthly progress reports for the CDOT Project Engineer documenting project progress, conformance with Contractor's schedule, status of change orders, and potential or ongoing problems.

3.2 Change Orders: Prepare project change orders and minor contract revisions. Obtain Resident Engineer's pre-approval for all changes.

3.3 Project Coordination: Track, update and monitor project costs versus budget and notify CDOT Project Engineer of anticipated problems in a timely manner. Coordinate project personnel including inspectors and material testers.

3.4 Certified Payroll: Review certified payroll documentation provided by the Contractor and conduct random interviews of Contractor employees to determine if the Contractor is in conformance with CDOT EEO/Labor Compliance policies.

Deliverables generated during the project will include the following and will be submitted throughout the duration of the project, or at specific dates commensurate with the deliverable's intent:

- Monthly Progress Reports.
- Project correspondence generated and received during the project.
- Project Materials Testing Records including all required test reports and certifications.
- Monthly progress pay estimates.
- Construction management records generated including minutes of meetings, project diary, inspection reports, quantity records, contract modification orders, schedules, and other documentation as prepared during the course of construction in accordance with CDOT requirements.
- Complete "as-constructed" plans.

Inspection Services

Inspection work shall conform to the CDOT Construction Manual, the Inspector Checklist and SiteManager requirements. Each of the Consultant's field inspectors shall maintain a daily diary for each day the Consultant performs work on the project. They shall use CDOT's Form 103 or automated 103a - Project Diary, or other form approved by the Resident Engineer. SiteManager documentation procedures will apply. The contents of the diary shall be brief and accurate statements of progress and conditions encountered during the prosecution of the work. Editorial comments are not to be incorporated in the diaries or on any written

correspondence applicable to the project. A copy of the daily diary shall become a part of the permanent project record.

Inspection responsibilities may include but are not limited to the following:

1. Preparing and transmitting updates of construction activities to the CDOT's Public Information Officer.
2. Periodic reports and billings required by CDOT Procedural Directive 400.2.
3. Monitoring and documenting contractor payroll compliance.
4. Participation in weekly progress meetings with contractor, subs, utilities and other interested parties.
5. Securing project documentation from the contractor.
6. Anticipating project problems and directing solutions to the Consultant Project Engineer.
7. Reviewing drawings and data submitted by the construction contractor and suppliers for conformance with the specifications. Inform and obtain concurrence as needed from the Consultant Project Engineer and keep relevant documentation for project records.
8. Maintaining accurate notes reflecting actual construction details to be used in preparation of as-constructed plans.
9. Communicating with adjacent landowners as required toward resolving issues that arise due to construction.
10. Review and approve the Contractor's Method of Handling Traffic if delegated by the Consultant Project Engineer.
11. Monitoring compliance with and taking appropriate action to preserve safety on the project for all workers and traveling public in accordance with Method of Handling Traffic (MHT) and the Manual of Uniform Traffic Control Devices (MUTCD).
12. Initial, follow up, and final inspections of work in progress including interim and final measurements and coordination with Consultant Tester to ensure materials testing requirements are met.
13. Promptly notifying contractors and Consultant Project Engineer of non-compliance with the contract plans and specifications.
14. Performance of special tests, investigations, or monitoring which are required to fulfill the intent of the CDOT inspection program.
15. Preparation of inspection documentation for development of progress payments for the contractor in accordance with prescribed procedures.
16. Submittal of standard documentation reports no later than the following working day.
17. Preparation of routine correspondence to the contractor, CDOT Staff, local agencies, etc.
18. Providing liaison and communication to contractor field crews.
19. Assist the Consultant Project Engineer with preparation of final "As Constructed" plans.

20. Assist in preparing punch lists of uncompleted work, non-conformance reports, and deficiency notices.
21. Assist in preparing responses to contractors' and suppliers' requests for information, submittals, change notices, claims, and correspondence.

Materials Testing

The consultant shall sample, test, inspect and document all materials generated and produced on the project. This includes: materials delivered to the project that are listed in the Summary of Approximate Quantities in accordance with the SCHEDULE in the Field Materials Manual; materials that may be added to the project through contract modification; and altered material quantities whether increased or decreased. The consultant's Project Engineer and field tester(s) shall review project quantities on a monthly basis to ensure that sufficient tests have been performed for the material placed to date. The consultant shall also provide any other services as requested by the CDOT Resident Engineer or Consultant Project Engineer.

Testing of materials that are specifically designated to be pre-inspected or pre-tested by this or any other Department of Transportation shall remain the responsibility of CDOT. The consultant shall document and transport samples of any and all materials to the CDOT Central Laboratory that are required to be tested by CDOT regardless of pre-inspection or pre-testing responsibilities. The items and test frequencies of Department tested materials shall be in accordance with the column titled "Central Laboratory" in the SCHEDULE. The EXCEPTION shall be when the specific project task order is set-up to randomly sample and test highway striping paint. The consultant shall have the ability to sample and submit paint samples to a certified lab designated testing.

The consultant shall sample, test and inspect those specified materials utilized in construction. Other services may be requested in writing by the CDOT Resident Engineer. Test results and inspection observations shall be documented by the consultant and approved by the Consultant Project Engineer in accordance with the references cited above in Project Standards. The materials tester will be responsible for materials sampling, testing, and documentation as directed by the Project Engineer to supplement the project testing staff during peak periods. The materials tester needs to be certified to perform the project sampling and testing in accordance with CDOT requirements. These requirements typically include the following certifications: CAPA levels A&B, ACI, and WAQTC, and nuclear gauge operation.

Initial Project Meeting

The Consultants, CDOT staff, and other interested parties (ie. Town of Berthoud, Town of Mead, Weld County, key utility companies) shall meet to coordinate and schedule the required work. The Consultant shall complete all work in accordance with the approved schedule.

Documentation

The Consultant shall provide all correspondence and applicable CDOT forms to the Resident Engineer or his authorized representative for review and signature.

The Consultant personnel shall be capable of preparing CMO's, justifications for CMO's and MCR's; price justification (force account analysis); review of MHT's, construction quantity calculations required for this type of project; inspection reports; daily diaries; site manager; review of 205's; and other construction administration documentation required per CDOT construction manual.

Each of the Consultant's personnel shall maintain a daily diary for each day they perform work on the project. They shall use CDOT's Automated Form 103a - Project Diary unless otherwise approved by the Resident Engineer. The contents of the diary shall be brief and accurate statements of progress and conditions encountered during the prosecution of the work. Editorial comments are not to be incorporated in the diaries or on any written correspondence applicable to the project. A copy of the daily diary shall be given to the Consultant Project Engineer within one working day of its date.

Personnel Qualifications

Consultant shall have strong experience in critical path scheduling, public relations, bridge deck repair, utilities, and environmental work and compliance. The Project Engineer will be expected to handle the schedule and daily public-relations issues. The Consultant will be expected to work in Site Manager and be thoroughly familiar with CDOT forms and documentation requirements. Personnel qualifications and staffing levels for the project shall be subject to the approval of Resident Engineer. CDOT will reserve the right to review the resume and interview any new proposed staff to the project. The Consultant shall be certified as defined by the requirements set.

The Consultant Project Engineer (PE) will work on the project at the level of Project Engineer, and shall have at least 4 years of experience as a Project Engineer, either with CDOT or as a consultant.

Personnel provided by the consultant who do not meet all of the specified requirements, or who fail to perform their work in an acceptable manner, shall be removed from the project when determined and directed by the Resident Engineer.

CONSTRUCTION MANAGEMENT REQUIREMENTS

CHECKLIST

The following checklist shall be used to establish the Construction Management responsibilities of the individual parties for this project.

The checklist shall be prepared by placing an "✓" under the responsible party opposite each of the tasks listed below.

When a task does not apply to the project, not-applicable "N/A" shall be placed under both parties.

Tasks that will be performed by CDOT Headquarters staff will be so indicated.

The Region in accordance with established policies and procedures shall determine who will perform all other tasks that are the responsibility of CDOT.

DESCRIPTION OF TASK	CONSULTANT	CDOT
1. Conduct the Pre-Bid conference, answer all questions, and maintain a log of all decisions given and/or made.		✓
2. Show project work site to prospective bidders, answer all questions regarding plans and specifications, and maintain a log of all decisions given and/or made.		✓
3. Coordinate all construction contract activities with appropriate stakeholders.	✓	
4. Distribute ten award sets of plans and specifications to the CDOT Resident Engineer.		✓
5. Issue Notice to Proceed to the Contractor.		✓
6. Schedule, conduct and prepare minutes of all project meetings as follows:		
a. Job Showing		✓
b. Pre-construction Conference	✓	
c. Partnering Workshop (if required)	✓	
d. Weekly Project Meetings	✓	
e. Pre-Survey Conference (if required):		
i. Construction Staking	✓	
ii. Survey Monumentation	✓	
f. Bridge Construction Communications	✓	
g. Structural Concrete Pre-pour Conference	✓	
h. Concrete Pavement Prepaving Conference	✓	
i. HBP Prepaving Conference	✓	
j. Contractor Weekly Safety "Tool Box" Meeting	✓	

DESCRIPTION OF TASK	CONSULTANT	CDOT
7. Public Relations:		
a. Prepare and coordinate with CDOT and others to publish and distribute public notices of all planned construction activities and schedules to the media, property owners, local residents, tenants, and other appropriate stakeholders affected by the project.	✓	
b. Perform public relation tasks with appropriate individuals as requested by CDOT.	✓	
c. Explain construction and work with adjacent property owners to resolve issues that arise during construction.	✓	
8. Review, comment, accept and/or approve as appropriate the following submittals: <i>Note: This list is not all-inclusive and other submittals may require action as directed by CDOT.</i>		
a. CDOT Form # 205 - Sublet Permit Application after Form #713 has been checked by the Region EEO Administrative Program Specialist.	✓	
b. Method of Handling Traffic	✓	
c. Progress Schedules	✓	
d. Method Statements	✓	
e. Shop drawings per 105.02	✓	
f. Working drawings per 105.02	✓	
g. Other submittals per 105.02	✓	
h. All EEO, Labor compliance requirements	✓	
i. Other submittals as directed	✓	
9. Construction inspection including calculations, measurements, and documentation of interim and final pay quantities as directed by the Project Engineer.	✓	
10. Contact Modification Order (CMO), Minor Contract Revisions (MCR), and Pay Estimates		
a. Prepare CMO's, MCR's and Pay estimates with proper documentation (including all Site Manager entry).	✓	
b. Review and Approve CMO's, MCR's, and Pay Estimates		✓
11. Perform required EEO/AA/DBE/OJT or labor compliance tasks as requested as follows:		
a. Conduct Contractor/Subcontractor reviews to ensure conformance with	✓	

DESCRIPTION OF TASK	CONSULTANT	CDOT
the Equal Employment Opportunity (EEO)/Affirmative Action (AA)/DBE/OJT requirements contained in the contract. (Standard Special Provisions, Project Special Provisions and FHWA Form 1273.)		
b. Complete and submit to the CDOT Resident Engineer, the required number of CDOT Form 280 - Equal Employment Opportunity and Labor Compliance Verification.	✓	
c. Monitor DBE participation to ensure compliance with the "commercially useful function" requirements.	✓	
d. Complete and submit to the CDOT Region EEO Administrative Program Specialist, the applicable number CDOT Form #200 - OJT Training Questionnaire, when project utilizes OJT's.	✓	
e. Check certified payrolls to verify contractor/subcontractor compliance with contract requirements. Project personnel trained in payroll checking shall complete the checking. (Contact the Region EEO Administrative Program Specialist for training requirements.)	✓	
f. Coordinate submittals by Contractor and all subcontractors of FHWA Form 1391 (Highway Construction Contractor's Annual EEO Report) to the CDOT Region EEO Administrative Program Specialist.	✓	
12. Materials:		
a. CDOT Form # 250 - Materials Documentation Record:		
i. Fill out and distribute CDOT Form # 250 before the Contractor commences work.	✓	
ii. Complete Form # 250 after work is completed; distribute per instructions in CDOT Materials Manual.	✓	
b. Approve changes to the Typical Section (requires a CMO).	✓	
c. Development, checking and design mix approvals:		

DESCRIPTION OF TASK	CONSULTANT	CDOT
i. Concrete	✓ submit to CDOT	
ii. Hot Bituminous Pavement	✓ submit to CDOT	
d. Acceptance of manufactured products	✓	
e. Inspecting fabrication of structural steel and precast concrete structural components.	✓	